GRT INSTITUTE OF ENGINEERING AND TECHNOLOGY, Tiruttani.

(Approved by AICTE, New Delhi Affiliated to Anna University, Chennai.)

Department of Electronics & Communication Engineering

III Year - VIth Semester

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MINIMUM LEARNING MATERIAL

REGULATION – 2013

SYLLABUS

MG6851 PRINCIPLES OF MANAGEMENT L T P C

3 0 0 3

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management

UNIT IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication –communication and IT.

UNIT V CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL PERIODS: 45

TEXT BOOKS:

T1. Stephen P. Robbins & Mary Coulter, “Management”, 10th Edition, Prentice Hall (India) Pvt. Ltd., 2009.

T2. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, 6th Edition, Pearson Education, 2004

REFERENCES:

R1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management” 7th Edition, Pearson Education, 2011.

R2. Robert Kreitner & Mamata Mohapatra, “Management”, Biztantra, 2008.

R3. Harold Koontz & Heinz Weihrich “Essentials of management” Tata Mc Graw Hill, 1998.

R4. Tripathy PC & Reddy PN, “Principles of Management”, Tata McGraw Hill, 1999.

UNIT 1 – INTRODUCTION TO MANAGEMENT AND ORGANIATIONS

PART A

1. What is the function of manager? (Nov 16, May 16)

- Planning is a primary function of an organization
- It helps in achieving objectives
- It is done to cope with uncertainty and change
- It helps in facilitating control
- It helps in coordination
- Planning increases organizational effectiveness
- Planning guides in decision – making.

2. Give the trends in management. (Nov 16)

(1) Identification of problem
(2) Diagnosis and analysis the problem
(3) Search for alternatives
(4) Evaluation of alternatives
(5) Selecting an alternatives
(6) Implementation and follow up

3. Define Administration. (May 13, Nov 15)

According to E.F.L Breech "Administration is that part of management which is concerned with the installation and carrying out of the procedures by which the programmer is laid down and communicated and the progress of activities is resulted and checked against plans. This Breech concerns administration as a part of management".

4. What is globalization? (May 13)

Liberalization eliminates licensing quantitative restrictions and other regulatory and discretionary controls. The liberalization has enormously expanded the scope of the private sector. Now only a small number of industries are reserved. The liberalization of the policies towards foreign capital and technology and import liberalization have given further growth and competition.

5. Define 'Management'. (May 17, 16)

Koontz and weihrich define management in a simple form as: "Management is the process of designing and maintaining an environment in which individuals working together in groups efficiently accomplish selected aims".

6. Specify the functions of management. (Nov 12, May 16)

The following are five basic functions of management:

1. Planning
2. Organizing
3. Staffing
4. Directing
5. Controlling

7. Name the different levels of management. (May 12)

The three levels of management commonly found in any organization are top, middle and lower management.

8. Who is known as father of modern operation management theory? **(May 12, Nov 15)**

Henri Fayol is called “Father of modern operation theory “.

9. Mention the role of Managers. (May 11, May 14, Nov 16)

1. Figurehead role
2. Leader
3. Liaison
4. Monitor
5. Disseminator
6. Spokes Person
7. Entrepreneur
8. Disturbance Handler
9. Resource Allocator
10. Negotiator

10. What are the various functions of management? (Nov 11, May 16)

1) Planning
2) Organizing
3) Staffing
4) Coordinating
5) Controlling.

11. Difference between administration and management? (Dec 14, May 14, Nov 15)

Liberalization eliminates licensing quantitative restrictions and other regulatory and discretionary controls. The liberalization has enormously expanded the scope of the private sector. Now only a small number of industries are reserved. The liberalization of the policies towards foreign capital and technology and import liberalization have given further growth and competition.

12. **What are the essential skills of manager? (Nov 13)**

Koontz and weihrich define management in a simple form as: "Management is the process of designing and maintaining an environment in which individuals working together in groups, efficiently accomplish selected aims".

13. **What is Scientific Management?**

Fredrick Winslow Taylor is called "Father of Scientific management". Taylor attempted a more scientific approach to management as well as the problems and the approach was based upon four basic principles.

- Observation and measurement should be used in the Organizations.
- The employees should be scientifically, selected and trained.
- Due to scientific selection and training, an employee has the opportunity of earning a high rate of pay.
- A mental revolution in the form of constant cooperation between the employer and employees should be given the benefits of scientific management.

14. Is management –an art or science? (May 16)

The three levels of management commonly found in any organization are top, middle and lower management.

PART B

1. **Discuss the scope and nature of management. (Nov 12, 15)**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 7]
2. **What are the environmental factors that affect business? Explain. (Nov 12, 15)**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 61]
3. **Enumerate the trends and challenges of Management in globalized era. (Nov 12)**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 52]
4. **Explain the detail about the different types of business organization. (Nov 16, 15, May 17)**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No.1.33]
5. **Difference between private and public sectors enterprises.**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No.1.42]
6. **Write a short note on sole proprietorship and partnership.**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No.1.55]
7. **Explain the principles of administrative theory of management with suitable illustrations. (Nov 13, May 13, May 16)**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 28]
8. **Explain the salient features of neo- classical theory of management with the human relations approach and behavioral science approach. (Nov 13, May 16, Nov 16)**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 26 & 33]
9. **State and explain the important contributions of Taylor and Fayol in the field of management thoughts. (May 12, May 13, May 16)**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No.1.30]
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 1.36]
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 27 & 28]
10. **Discuss the role of manager. (May 12, May 17)**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 9]
11. **Describe the important functions of management. (May 12, 17)**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 8]
12. **Illustrate the various organizational culture and environment with a neat diagram. (Nov 15, Nov 16)** Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 43]
13. **Describe the relative importance of each type of the skills to lower, middle and upper level managers. (Nov 11)**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 11]
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 1.53]
14. **Explain the system based approach towards the management. (Nov 11, May 14, Nov 16)**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 35]
15. **Compare the manager Vs Entrepreneur.**
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 1.36]
16. **Explain the trends and challenges of management in global scenario. (May 13)**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 79]

UNIT 2 – PLANNING

PART A

1. Define MBO. (May 11, 12, Nov 16)

MBO is a process whereby superior and subordinate manager of an enterprise jointly identify its common goals, define each individual's major areas of responsibility in terms of results expected of him, and use these measures as guides for operating the unit and the contribution of each of its members is assessed.

2. Mention any two features of decision making. (May 11)

1. Decision – making is a selection process. The best alternative is selected among many available alternatives.
2. Decision – making is a goal – oriented process. Decisions are made to achieve some goal or objective.
3. Decision – making is the end process. It is preceded by a detailed discussion and selection of alternatives.
4. Decision – making is a human and rational process involving the application of intellectual abilities. It involves deep thinking and foreseeing things.

3. What is the main purpose of planning? (Nov 12, May 12, 13, May 17)

- Planning is a primary function of an organization
- It helps in achieving objectives
- It is done to cope with uncertainty and change
- It helps in facilitating control and coordination
- Planning increases organizational effectiveness
- Planning guides in decision – making.

4. Define the term strategic planning? (Nov12, May 14)

A strategic plan is an outline of steps designed with the goals of the entire organization as a whole in mind, rather than with the goals of specific divisions or departments.

5. List the different types of planning. (May 12)

Four major types of plans can help managers achieve their organization's goals:

1. Operational plan
2. Tactical plan
3. Strategic plan
4. Contingency plan

6. Distinguish between planning and tactical planning. (May 15)

Koontz and Weihrich have defined MBO as follows: "MBO is a comprehensive managerial system that integrates many key managerial activities in a systematic manner and that is consciously directed towards the effective and efficient achievement of organizational and individual objectives".

7. What is meant by policies? (May 14, Nov16)

According to Alfred D. Chandler, "Strategy is the determination of basic long – term objectives and adoption of course of action and allocation of resources to achieve these goals"

8. What are the objectives of planning? (May 13, 16)

- Planning is a primary function of an organisation
- It helps in achieving objectives
- It is done to cope with uncertainity and change
- It helps in facilitating control and coordination

- ❖ Planning increases organizational effectiveness
- ❖ Planning guides in decision – making.

9. Name any four Quantitative forecasting techniques. (May 13)

1. Failure to teach the philosophy of MBO
2. Failure to give guidelines to goal setters.
3. Difficulty in setting goals.
4. Emphasis on short – term goals
5. Danger of inflexibility
6. Time – consuming
7. Increased paper work

10. Define "Mission".

Mission may be define as "a statement which defines a role that an organization plays in the society".

11. Name any two important procedures in organization.

1. Procedures for placing orders for material and equipment.
2. Procedures for sanctioning different types of employees leave.

12. State any four limitations of planning.

1. Lack of accurate information
2. Time and cost
3. Inflexibility
4. Delay during emergency period.

13. Classify policies.

1. Formulated policies
2. Appealed policy
3. Imposed policy
4. Written policies
5. Implied policies

14. Define planning premises. (Nov 15)

Planning premises are the assumptions that should be made about the various elements of the environment. It provides the basic framework in which plans operate. This premises may be internal or external. Internal premises include organizational policies, resources of various types, sales forecast and the ability of an organisation to withstand the environmental pressure. External premises include the total factors in task environment, such as political, social, technological, competitors, plans and actions, and government policies, etc…

PART B

1. **What are the steps in the planning process? (May 11, 14, Nov 15, May 17)**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 147]

2. **Mention any four advantages and four limitations of planning. (May 11)**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 155]

3. **State and explain the common steps involved in a typical managerial decision making process. (May 11, 16, Nov 16, May 17)**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 122]

4. **Discuss the types of policies.**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 2.68]

5. **Explain Business portfolio matrix. (Nov 11)**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 3.25]

6. **Define planning. Explain the Planning tools and techniques.**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 2.8]

7. **Describe in detail the various types of organizational plans. (Nov 11)**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 149]

8. **What are the different type's decisions and decision making process? (Nov 11, May 13, 14, Nov 16)**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 129]

9. **Explain the principles of planning. (May 12)**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 146]

10. **Describe the nature and purpose of planning. (May 12, 16)**
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 2.82]
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 148]

11. **With the help of block diagram, explain the process of management by objectives (MBO). (May 12, Nov 15, 16)**
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 2.34]

12. **Define planning. Explain the steps involved in the planning process. (Nov 12, May 14, Nov 13, 15, May 17)**
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 2.8]

13. **Write short notes on the following: (May 12, Nov 15, May 16)**
    1. **Write the objective of planning.**
    2. **Types of strategies.**

    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 148 & 169]

14. **What are different types of plans? Explain each in detail. (Nov 16)**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 149]

15. **Explain the selection procedure of an alternative. (May 17)**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 213 & 214]

16. **Write short note on SMART objectives.**
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 2.33]

17. **Define Forecasting. Explain the various forecasting techniques used for decision making process.**
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 2.52]

18. **Define strategic planning. What are the steps involved in strategic planning? (May 13)**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 164 & 166]

19. **Define decision making process. Explain the process followed while taking a decision in normal situation. (May 13, 14, Nov 16)**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 122 & 129]

UNIT – III ORGANISING

PART A

1. **What is the purpose of Organization? Nov 13, May15**
   - Facilitates Administration
   - Increases the efficiency management
   - Stimulates creativity and innovation
   - Facilitates growth and diversification and
   - Facilitates co-ordination and communication.

2. **Define Staffing? Dec 14**

   Staffing is the part of management process which is concerned with the procurement utilization and maintenance and development of a large satisfied work force on the organization.

3. **Difference between formal and informal organization. Nov 13, May 15**

S.NO	Point of view	Formal organization	Informal Organization
1	Nature	Planned and official	Unplanned and Unofficial
2	Size	Large in size	Small in size
3	Number of groups	More	Less
4	Control process	Rigid rules and regulation	Group norms and values

4. **Write the Uses of Organization Chart.**

   The organization chart pinpoints the weakness of an organization. This will helps to overcome the short coming of organization. It tells quickly who is responsible for particular function.

   It is useful in showing nature of an organization and changes if any in the existing staff and new comers.

5. **State the importance of HRM? May 17**

   It helps to make use of the Organizational resources.
   It prov ides effective and efficient personals to the organization.
   Helps to discover talented and competent persons.
   Helps to ensure uninterrupted flow of business.

6. **Define career development.**

   Career development is a ongoing process by which individual progress through a series of stages each of which is characterized by a relatively unique set of issues, themes or tasks.

7. **What is performance appraisal? Nov 16, May 17**

   Performance appraisal evaluates the performance of worker also his potential for development.

8. **Compare centralization and decentralization.**

S.No	Centralization	Decentralization
1	The authority for most decisions is concentrated at the top of the managerial hierarchy	The authority to be dispersed by extension and delegation through all levels of management
2	It is the systematic and consistent reservation of authority at central points within an organization	It applies to the systematic delegation of authority in an organization wide context

9. **State the importance of staffing? Nov 15**

   It helps to make use of the Organizational resources.
   It provides effective and efficient personals to the organization.

Helps to discover talented and competent persons.
Helps to ensure uninterrupted flow of business.

10. Write down the career stages.

Exploration stage
Establishment stage
Mid- career stage
Late- career stage
Decline stage.

11. Difference between authority and power. (Nov 15)

S.No	Power	Authority
1	It is ability to command & influence behavior of another	It is institutional right to command
2	It does not follow any hierarchy	It follow hierarchy
3	May exist between 2 persons	Superior and subordinate relationship
4	Being personalized attribute, cannot be delegated	It can be delegated

12. Define functional authority.

It is the right which is delegated to an individual or a department to control specified processes practices, policies or other matters relating to activities, undertaken by persons in other departments.

13. Difference between selection and recruitment.

S.No	Selection	Recruitment
1	It is a positive approach	Negative approach
2	It proceeds selection	It follow recruitment
3	The candidate have not to cross over many hurdles	Many hurdles have to be crossed
4	It encourage large number of candidate for a job	It attempts at rejecting un suitable candidates

14. Write the note on training.

Training is the act of increasing the knowledge and skills of an employees for doing a particular job.

PART-B

1. **Explain about the organizational culture.** **May 13, Nov 16**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 3.15]

2. **Discuss the various types' centralization** **Nov 16**
   Ref. "Management" by Stoner, Freeman, Gilbert, 6th Edition. [Page. No. 385]

3. **Explain briefly about the various types of departmentation.** **May 13, Nov 16**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 187]

4. **Explain the process involved in selecting and recruiting a graduate trainee in organization** **May 14, 17**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 212]

5. **Explain the difference between line and staff organization with an example. Discuss its merits and demerits.**
   Ref. "Management" by Stoner, Freeman, Gilbert, 6th Edition. [Page. No. 379]

6. **What is meant by departmentation? Explain the need and importance of departmentation.** **May 13, Nov 16**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 3.52]
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 187]

7. **Distinguish between formal and informal organization** **Nov 13**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 3.88]

8. **Explain the steps in selection process** **May 14, May 17**
   Ref. "Management" by Stoner, Freeman, Gilbert, 6th Edition. [Page. No. 413]

9. **Explain any four methods of performance appraisal.** **Nov 15**
   Ref. "Management" by Stoner, Freeman, Gilbert, 6th Edition. [Page. No. 420]

10. **Explain the steps involved in the quality control process with advantages and disadvantages.**
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 3.15]

11. **Draw and explain the concept of job design.**
    Ref. "Management" by Stoner, Freeman, Gilbert, 6th Edition. [Page. No. 389]

12. **Write short note on Human recourse management.** **May 17**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 207 all topics]

13. **Difference between career planning and management.**
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 3.163]

14. **What is the performance of management?**
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 3.122]

UNIT IV – DIRECTING

PART A

1. Define Direction. **May 12, May 13**

Direction may be defined as the process of instructing, guiding and inspiring human factors in the organization to achieve organization objectives.

2. Mention the importance of Leadership **Nov 15, May 16**

1. Motivating Employees
2. Leader develops team work
3. Better utilization of manpower
4. Creating confidence to followers
5. Directing group activities
6. Building morale
7. Maintaining discipline

3. What is Laissez – faire?

Complete freedom is given to the subordinates so that they plan, motivate, control and otherwise be responsible for their own actions.

4. Differentiate Innovation and Invention. **Nov 15**

Innovation means the use of creative ideas. It is not only relevant to high-tech enterprises but also crucial for old-line, traditional companies, which may not service without the infusion of innovation.

Ex: A new product or a service.

Invention means really finding new things that are not already available. It is mostly applicable in the field of science.

Ex: Invention of radio.

5. What is job enrichment? **May 16, 17**

Building into jobs a higher sense of challenge and achievement.

(Or)

Job enrichment is therefore based on the assumption that in order to motivate personnel, the job itself must provide opportunities for the achievement, recognition, responsibility, advancement and growth.

6. Mention the various elements in the process of communication

1. Sender
2. Communication Channels
3. Symbols
4. Receiver
5. Noise and feedback in communication

7. What is brainstorming? **Nov 15, May 13**

This kind of training is given to increase people's creativity and decisional ability. These types of training individual participants are encouraged to give their own ideas to resolve the existing problem.

8. What are the elements in the maslow's hierarchy of needs? May 13, Nov 16

Higher level needs can be satisfied in many more ways than the lower level needs Various level needs are inter dependent and overlapping

9. What is effective communication? Nov 16

- The information should be simple and clear.
- In written communication, principle of line authority should be followed.
- The information should contain adequate information.
- Communication should be sent and reached timely.

10. Define motivation. May 14

Motivation is the art of getting work done by the subordinates in order to attain common goals of the organization. Getting work done is a difficult task.

11. Compare formal and informal communication.

Basic for Comparison	Formal Communication	Informal Communication
Another name	Official communication	Grapevine communication
Speed	Slow	Very fast
Reliability	More	Less
Time consuming	Yes	No

12. Who is a leader? May 16

Leadership is the process of influencing the behavior of others towards the accomplishment of goals in a given situation.

Leadership is the ability to influence others and enthusiastically making them to achieve the desired results.

13. Mention the types of leadership. Nov 15, May 16

1. Autocratic or Dictatorial leadership
2. Participative or Democratic leadership
3. Laissez – faire or Free – rein leadership

14. State job satisfaction.

Job satisfaction or employee satisfaction has been defined in many different ways. Some believe it is simply how content an individual is with his or her job, in other words, whether or not they like the job or individual aspects or facets of jobs, such as nature of work or supervision.

PART-B

1. **Explain about motivation techniques in detail. May 11**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 4.25]

2. **Explain porter and Lawler theory of motivation and Adam's equities theory of motivation. May 14, May 13, Nov 15, May 16, May 17**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 4.32]
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 354]

3. **Enumerate the leadership theories with clear examples. Nov 16**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 375]

4. **Compare formal and informal communication.**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 4.108]

5. **Explain the motivational theory in detail. May 14, May 13, Nov 15, May 16, May 17**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 345]

6. **Illustrate the communication and IT in detail. May 17**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 330]

7. **Explain the various leadership styles. May 16, Nov 16**
   Ref. "Management" by Stoner, Freeman, Gilbert, 6th Edition. [Page. No. 500]

8. **What is the barrier of effective communication? Explain the different types of communication. May 14, Nov 15, May 16, Nov 16, May 17**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 323]

9. **Explain the different motivation theories and also discuss how it is useful in leadership of an organization. May 14, May 13, Nov 15, May 16, May** Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 345 & 392]

10. **Difference between motivation and satisfaction.**
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 4.25]

11. **Explain the importance of communication.**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 319]

12. **Explain the various types of leadership with its different styles. May 16**
    Ref. "Management" by Stoner, Freeman, Gilbert, 6th Edition. [Page. No. 500 & 508]

13. **What are the essential qualities of good leader? May 16**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 392]

14. **Explain in detail the various types of individual and group behavior.**
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 4.98]

15. **Explain the different barrier and breakdown of communication process. May 14, Nov 15, May 16, Nov 16, May 17**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 323 & 325]

16. **What is selection and what are all the different stages used for selecting the candidates. May 17**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 214]

UNIT 5 – CONTROLLING

PART A

1. List out the types of control. **May 13**

1. Feedback control
2. Concurrent control
3. Feed forward control
4. Continuous control.

2. What are the basic steps involved in the process of controlling? **May 17**

1. Establishment of standards
2. Measurement of performance
3. Comparing performance with the slandered

3. Difference between budgetary and non budgetary control. **May 14**

	Budgetary Control	**Non Budgetary Control**
DEF	A system which uses budgets as a means of planning and controlling all aspects of producing services	It involves controlling using non budgeted expenses. i.e., Those expenses not defined in normal budgeted expenses
Objective	Aims at the maximization of profits	Non-Budgetary Control Techniques. 1 Statistical data: 2 Break- even point analysis: 3 Operational audit: 4 Personal observation:
Advantage	Improves the planning in the organization	Not Improves the planning in the organization
Limitation	Accuracy, expenditure	The major problem occurs when budget is applied mechanically and rigidly.

4. Write the uses of computers in management control. **May 16, Nov 16**

The use of computers for management controls poses an entirely new set of requirements on the system designers. Tied into automating information processing is the question of an adequate understanding of the control problem itself. For example, measurement or management reporting is often confused with the control process.

5. Mention the different types of budget. **May 14**

Budgetary and non budgetary control techniques

6. Define productivity and types. **May 14**

Productivity is a measure of how much input is required to produce a given output. i.e. the ratio output/input is called productivity.

7. What is meant by budget?

An estimate of income and expenditure for a set period of time.

8. Compare budgetary and non budgetary control techniques.

A system which uses budgets as a means of planning and controlling all aspects ofproducing services	It involves controlling usimg non budgeted expenses.i.e.those expenses not defined in normal budgeted expenses

9. Write the basic steps involved in the process of controlling? May 17

1. Establishment of standards
2. Measurement of performance
3. Comparing performance with the slandered

10. What are the potential pitfalls of budget?

Inaccuracy
Expenditure
Distortion of goals.

11. Give the note on Flexible Budget?

Flexible Budget is one which is designed to change in accordance with the level of activity actually attained. It is suitable when the estimation of demand is uncertain and the enterprise works under conditions of lack of material and labor power

12. List out the characteristics of Control function?

1) Functional Management
2) Continuous function
3) Future-oriented
4) Action-Oriented
5) Measuring the performance and
6) Planning the control

13. What is Zero base budgeting? Nov 15

Initially, the budget is designed from a Zero- base. The main element is ZBB is future objective orientation.

14. Define MIS. May 16

A system of obtaining abstracting, storing and analyzing data to productions information for the use in planning, controlling and decision making by managers at the time.

PART-B

1. **Impact of IT in management concepts-Discuss. Nov 16, May 17**
   Ref. "Management" by Stoner, Freeman, Gilbert, 6th Edition. [Page. No. 641]

2. **Write short note on quality control Nov 13**
   Ref. "Management" by Stoner, Freeman, Gilbert, 6th Edition. [Page. No. 586]

3. **Explain the steps involved in the process of controlling. May 13, Nov 15, May 17**
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 404]

4. **Mention the productivity problems in the management May 16, Nov 16**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 5.51]

5. **What tool and techniques do you suggest to improve productivity in Indian organization**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 5.48]

6. **Discuss in detail about budgetary and non budgetary control techniques.**
   May 14, 13, Nov 13, 15, 16
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 5.16]
   Ref. "Management" by Stoner, Freeman, Gilbert, 6th Edition. [Page. No. 594]

7. **Explain the following (i) purchase control (ii) Maintenance control May 14, Nov 15**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 5.98]

8. **Give an account of some popular non budgetary control techniques, with special reference to break even analysis and ratio analysis. Nov 15, 16**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 5.16]

9. **Discuss the various types of budget in detail. Nov 16**
   Ref. "Principles of Management" by Vijayaragavan. [Page. No. 5.16]
   Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 598]

10. **Explain the steps involved in the quality control process with advantages and disadvantages.**
    May 14
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 5.99]
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 409]

11. **Draw the system and process of controlling. Nov 15**
    Ref. "Management" by Stephen P.Robbins & Coulter, 10th Edition. [Page. No. 402]

12. **Write short note on reporting.**
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 5.83]

13. **What are the uses of computers in management control Nov 16, May 17**
    Ref. "Principles of Management" by Vijayaragavan. [Page. No. 5.46]
    Ref. "Management" by Stoner, Freeman, Gilbert, 6th Edition. [Page. No. 641 & 645]

14. A farm owner is seriously considering of drilling a farm well. In the past only 70% of wells drilled were successful at 200 feet depth in that area. Moreover, on finding no water at 200 feet, some persons drilled it further up to 250ft., but only 20% struck water at 250ft. The prevailing cost of drilling is Rs. 50 per foot. The farm owner has estimated that in case he does not get his own well, he will have to rs.15000 over the next 10 years to buy water from neighbours. The following decisions can be optimal.

(i) do not drill any well
(ii) drill up to 200ft
(iii) if no water is found at 200ft, drill further up to 250ft.

Draw an appropriate decision tree and determine the farm owner's strategy under EMV approach.

Ref. "Principles of Management" by Vijayaragavan. [Page. No. Q-37]

ANNA UNIVERSITY PREVIOUS YEAR QUESTION PAPERS

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Fourth/Fifth/Sixth/Seventh/Eighth Semester

Civil Engineering

MG 6851 – PRINCIPLES OF MANAGEMENT

(Regulations 2013)

PART A — (10 × 2 = 20 marks)

1. Define management.
2. What is an organizational culture?
3. State the purpose of planning.
4. List the planning tools available in business management.
5. What is delegation of authority?
6. Why performance management is important?
7. What is personality?
8. What do you understood on the term 'job enrichment'?
9. What is preventive control in management?
10. Why controlling is important?

PART B — (5 × 13 = 65 marks)

11. (a) Explain the different roles and functions of a manager.

Or

(b) Explicate the different types of business organizations.

12. (a) Explain the general planning process adopted by the business organizations.

Or

(b) Discuss the eight steps of decision making process.

13. (a) Explain the different types of organizational structures followed by the companies.

Or

(b) Describe the Human Resource Management activities in a business organization.

14. (a) Discuss the contemporary theories of motivation.

Or

(b) Identify the barriers in communication and explain how to overcome them.

15. (a) Describe in detail about the three steps in the control process.

Or

(b) Discuss the uses of computers and IT in Management control.

PART C — (1 × 15 = 15 marks)

16. (a) Explain the issues of organizational culture in modern business organizations.

Or

(b) "Job performance of individual is significantly influenced by the employee's attitude" — Discuss.

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Seventh Semester

Electrical and Electronics Engineering

MG 6851 – PRINCIPLES OF MANAGEMENT

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the functions of a Manager?

2. Give the current trends in Management.

3. What is meant by policies?

4. Define MBO.

5. Define "Departmentation".

6. What is meant by performance appraisal?

7. What are the elements in the Maslow's hierarchy of needs?

8. What is effective communication?

9. What are the uses of computers in management control?

10. Discuss the productivity problems in a management.

PART B — (5 × 16 = 80 marks)

11. (a) Explain in detail about the different types of business organization. (16)

Or

(b) Discuss in detail the evolution of management. (16)

12. (a) Discuss in detail about the classification of planning practices. (16)

Or

(b) Explain briefly about the decision making steps and process. (16)

13. (a) Explain briefly about the various types of departmentation. (16)

(b) (i) Discuss the types of Centralization. (8)

(ii) Explain about the organizational Culture. (8)

14. (a) Explain the various types of Leadership with its different styles. (16)

Or

(b) (i) Explain the different barriers and breakdowns of communication process. (8)

(ii) Difference between motivation and satisfaction. (8)

15. (a) Discuss in detail about the budgetary and non - budgetary control techniques. (16)

Or

(b) Impact of IT in management concepts - Discuss. (16)

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Sixth Semester

Mechanical Engineering

MG 6851 – PRINCIPLES OF MANAGEMENT

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Define Management.
2. Specify the functions of management.
3. What are the objectives of planning ?
4. List the steps in decision making process.
5. Define Organizing.
6. What is decentralization ?
7. Mention the various types of leadership styles.
8. What do you mean by the term 'Noise' in communication ?
9. Name any two HR related controlling techniques.
10. What are the uses of computers in handling information ?

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Is Management a Science or Art ? Discuss. **(8)**

(ii) Explain the evolution of Management in detail. **(8)**

OR

(b) Explain the fourteen principles of management advocated by Henry Fayol. **(16)**

12. (a) What are the objectives of planning ? Illustrate how you will set objectives for a manufacturing organization. **(16)**

OR

(b) With suitable example illustrate the steps involved in the process of decision making. **(16)**

13. (a) In detail explain the Nature and Purpose of Organization. **(16)**

OR

(b) Explain line and functional organizational structures with their advantages and limitations. **(16)**

14. (a) (i) What are the essential qualities of a good leader ? **(8)**

(ii) Name the motivational theories and explain any two of them. **(8)**

OR

(b) Discuss how the communication through electronic media is helpful for effective business. **(16)**

15. (a) (i) What is productivity ? Explain the methods of improving productivity in IT industry. **(8)**

(ii) List out the needs and characteristics of MIS. **(8)**

OR

(b) Write short notes on :

(i) Control of productivity problems and management **(8)**

(ii) Direct and preventive control. **(8)**

B.E – DEGREE EXAMINATION NOV / DEC 2015
Sixth Semester
Regulation (2008)
PART A (10*2=20)

1. Who is the father of scientific management? What is scientific management?
2. Distinguish between Administration and Management?
3. Define Planning Premises.
4. What is difference between Strategy and Policy?
5. What are the limitations of line and staff authority?
6. What is delegation of authority?
7. Name any four leadership styles.
8. What is meant by organizational culture?
9. Explain briefly the term zero – base budgeting?
10. What is quality control?

PART B (5*16 = 80)

11. (a) i) Discuss the scope and nature of management.

ii) What are the environmental factors that affect the business? Explain them.

Or

(b) With suitable examples explain the various types of business organization.

12. (a) Explain the steps involved in planning process.

Or

(b) Write short note on Management By Objectives and Types of Strategy.

13. (a) What is Span of control and explain the factors which influence the span of control.

Or

(b) Explain any four methods of performance appraisal.

14. (a) Explain any two theories of motivation.

Or

(b) Define Communication. What are the barriers to effective communication?

15. (a) With suitable examples explain any four non-budgetary control techniques.

Or

(b) i) Explain the concept and process of controlling in detail.

ii) Write a note on different types of control.

SYLLABUS

CS6303 COMPUTER ARCHITECTURE L T P C

3 0 0 3

UNIT I OVERVIEW & INSTRUCTIONS 9

Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions– Logical operations – control operations – Addressing and addressing modes.

UNIT II ARITHMETIC OPERATIONS 7

ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Sub word parallelism.

UNIT III PROCESSOR AND CONTROL UNIT 11

Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV PARALLELISM 9

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware

multithreading – Multi core processors

UNIT V MEMORY AND I/O SYSTEMS 9

Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

TOTAL PERIODS: 45

TEXT BOOKS:

T1. David A. Patterson and John L. Hennessey, “Computer organization and design’, Morgan Kauffman / Elsevier, Fifth edition, 2014.

REFERENCES:

R1. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, “Computer Organisation“, VI th edition, Mc Graw-Hill Inc, 2012.

R2. William Stallings “Computer Organization and Architecture” , Seventh Edition , Pearson Education, 2006

R3. Vincent P. Heuring, Harry F. Jordan, “Computer System Architecture”, Second Edition, Pearson Education, 2005.

R4. Govindarajalu, “Computer Architecture and Organization, Design Principles and Applications",first edition, Tata McGraw Hill, New Delhi, 2005.

R5. John P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata Mc Graw Hill, 1998.

R6. http://nptel.ac.in/.

UNIT-I OVERVIEW AND INSTRUCTIONS

PART-A

1. **How to represent instruction in a computer system? (JUNE'2016)**

Instructions are encoded as binary ***instruction codes***. Each instruction code contains of a ***operation code***, or ***opcode***, which designates the overall purpose of the instruction (e.g. add, subtract, move, input, etc.). The number of bits allocated for the opcode determined how many different instructions the architecture supports.

In addition to the opcode, many instructions also contain one or more ***operands***, which indicate where in registers or memory the data required for the operation is located. For example, and add instruction requires two operands, and a not instruction requires one.

```
15        12 11              6 5            0
+-----------------------------------+
| Opcode |  Operand    |  Operand   |
+-----------------------------------+
```

2. **Distinguish between auto increment and auto decrement addressing modes. (JUNE'2016)**

Auto increment mode is like register deferred mode in that at run-time, the address of an operand is contained in a register. However, with auto increment mode the contents of the register is incremented each time the instruction is executed. When an instruction that uses auto increment mode is executed, the following happens:

```
Add B     #26,(R4)+   ; add 26 to one  byte  at (R4), increment R4 by 1
```

Autodecrement mode is like register deferred mode (and like auto increment mode) in that at run-time, the address of an operand is contained in a register. However, with auto decrement mode the contents of the register is *decremented* each time the instruction is executed. When an instruction that uses auto decrement mode is executed, the following happens:

```
addB   #26,-(R4)    ; decrement R4 by 1, now add 26 to one  byte  at (R4)
```

3. **How CPU execution time for a program is calculated? (DEC'2015)**

Execution time:

CPU execution time for a program = CPU clock cycles for a program * clock cycle time.

Or

CPU execution time for a program = CPU clock cycles for a program / Clock rate

4. **If computer A runs a program in 10 seconds, and computer B runs the same program in 25 seconds, how much faster is A over B .**

Performance of A / Performance of B = Execution Time B/Execution Time B = 25/10 = 2.5

A is 2.5 times faster than B.

5. **Write the formula for CPU clock cycles required for a program.**

CPU Clock cycle required for a program = No.of instruction * cycles per instruction

Or

CPU Clock cycle required for a program = Instruction count * CPI

CPI – Clock per instruction.

6. **Define – Addressing Modes**

The different ways in which the operands of an instruction are specified are called as addressing modes.

The MIPS addressing modes are the following:

1. Immediate addressing

2. Register addressing
3. Base or displacement addressing
4. PC-relative addressing
5. Pseudo direct addressing

7. **Define – MIPS** .

Million Instructions Per Second (MIPS) is a measurement of program execution speed based on the number of millions of instructions.

MIPS is computed as:

MIPS = Instruction count / Execution time * 10^6

8. State Amdahl's Law. (DEC'2014)

Amdahl's law is used to calculate the performance gain that can be obtained by improving some portion of a computer. It states that performance improvement can be gained by using some faster mode of execution which is limited by fraction of the time the faster mode can be used.

Speed up = Performance of entire task using improved machine / Performance of entire task using old machine.

9. Brief about relative addressing mode with an example. (DEC'2014)

The PC-**relative addressing mode** can be used to load a register with a value stored in program memory a short distance away from the current instruction. It can be seen as a special case of the "base plus offset" **addressing mode**, one that selects the program counter (PC) as the "base register".

```
+------+------+---------+----------------+
| load | reg1 | base=PC |     offset     |
+------+------+---------+----------------+

reg1 := RAM[PC + offset]
(Effective address = PC + offset)
```

10. List the eight great ideas invented by computer architects. (May'2015)

The eight great ideas in computer architecture are:

1. Design for Moore's Law 2. Use Abstraction to Simplify Design 3. Make the Common Case Fast 4. Performance via Parallelism 5. Performance via Pipelining 6. Performance via Prediction 7. Hierarchy of Memories 8. Dependability via Redundancy

11. What is an Instruction register? (DEC'2016)

The stored program concept **means** that data and instructions are both logically the **same** and can both be stored in **memory**. The von Neumann architecture is built around this principle. It is important because the human does not have to execute instruction without the machine.

The idea was introduced in the late 1940s by John von Neumann, who proposed that a **program** be electronically **stored** in binary-number format in a memory device so that instructions could be modified by the computer as determined by intermediate computational results.

12. What is instruction set architecture? (DEC'2015)

The instruction set, also called instruction set architecture (ISA), is part of a computer that pertains to programming, which is basically machine language.

The instruction set provides commands to the processor, to tell it what it needs to do. The instruction set consists of addressing modes, instructions, native data types, registers, memory architecture, interrupt, and exception handling, and external I/O.

13. List the major components of a computer system. (May 2017)

1, Input unit - Key board, Mouse
2. Central Processing Unit - a. Memory Unit(Main memory) - RAM
b. Arithmetic and Logic Unit – Performa ALU operations
c. Control Unit – Produce control signal to other units
3. Output Unit - Visual display unit , Printer.

14. State the need for indirect addressing mode. Give example. (May '2017)

This mode uses a register to hold the actual address that identifies either the source or the destination to be used in the data move. What we have here is a **pointer**. R0 and R1 can be used for internal memory.

PC or DPTR must be used for external memory access. Indirect mode is indicated with the character. When working with external memory, the MOV instruction has an "X" appended to it.

```
mov   DPTR, #4000h      ; put the address 4000 into the data pointer
movx  @DPTR, 0h         ; set address 4000h to 0.
```

PART B

1. List and explain the various developments made during different generations of computer.
Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:25]

2. Briefly describe the Power wall.
Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No: 40-42]

3. What is an addressing mode? Explain the various addressing modes with suitable examples. (DEC'2015)
Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No: 116-120]

4. Discuss about the various techniques to represent instructions in a computer system. (MAY'2015)
Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse [Page 1– 21 to1- 24]

5. Write short notes on instruction format.
Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse [Page 1-27 to 1-29]

6. Explain important measure of the performance of a computer and derive basic performance equation. (MAY'2017)
Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:32-40]

7. State the limitations of uni processor and advantages of multiprocessor system.
Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse [Page : 1-20]

8. Discuss the Logical operations and system control operations of computer.
Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse [Page 1- 26 to 1-27]

9. Explain in detail the various components of computer system with neat diagram. (DEC'2014)
Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse [Page 1-3 to 1-6]

10. State the CPU performance equation and discuss the factors that affect performance.

(DEC'2014)
Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No: 36]

11. **Explain about Instruction and Instruction types with example.**
    Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:80-87]

12. **Discuss the dada transfer operations and transfer control operations of computer.**
    Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse [Page 1- 25 and 1-27]

UNIT-II ARITHMETIC OPERATIONS

PART-A

1. **How overflow occur in subtraction? (MAY'2015)**

   Overflow in subtraction normally accomplished by negating the subtrahend and adding it to the minuend. Any carry-out is discarded. If 2 Two's Complement numbers are **subtracted**, and their signs are different, then **overflow occurs** if and only if the result has the same sign as the subtrahend.

2. **What do you mean by sub word parallelism? (MAY'2015)**

   Suppose the size of data item with in the vector is 128n bits , the processor can use parallelism to perform simultaneous operations on short vectors of sixteen 8 bit operands, eight 16 bit operands , four 32 bit operands. Such parallelism occurs with in a wide word known as sub word parallelism.

3. **What are the overflow /underflow conditions for addition and subtraction? (DEC'2015)**

   Overflow occurs only when adding two numbers that have the same sign. The carry bit from the MSB position is not a sufficient indicator of over flow when adding signed numbers. When both operands a and b have the sign and over flow occurs when the sign of result does not agree with sign a and b.

4. **State the representation of double precision floating point number? (DEC'2015)**

   A number in double precision format is given as

   Sign bit - 1 bit
   Exponent - 11 bits
   Mantissa - 52 bits

Ex:	1	100 0000 0111	0011001100110…..0
	Sign(1 bit)	Exponent (11 bit)	Mantissa(52 bits)

5. **What is a guard bit and what are the ways to truncate the guard bit? (DEC'2016)**

   The mantissa of initial operand and final results are limited to 24 bits including the implicit leading 1. But if we provide extra bits in the intermediate steps of calculations we can get maximum accuracy in the final result. These extra bits used in the intermediate calculation are called guard bits.

   Different ways to truncate guard bits:
   1. Chopping
   2. Van Neumann rounding
   3. Rounding.

6. **State the rules for floating point division.**
   1. Subtract exponents and add bias(127 in case of single precision and 1023 in case of double precision)
   2. Divide the mantissas and determine the sign of the result.
   3. Normalize the result.

7. **Define little endian arrangement.**

   There are two ways that byte address can be assigned:
   1. Little endian: When the lower byte addresses are used for the less significant bytes(the right most byte), it is called as little endian.
   2. Big endian: The lower byte addresses are used for most significant bytes then they are called as big endian.

8. Define underflow and overflow.

Under flow: In a single precision if the number requires an exponent less than - 126 or in a double precision if the number requires an exponent less than -1022 to represent its normalized form the under flow occurs.

Over flow: In a single precision if the number requires an exponent greater than +127 or in double precision if the number requires an exponent greater than + 1023 to represent its normalized form the over flow occurs.

9. What is the advantage of non-restoring over restoring division?

Non restoring division avoids the need for restoring the contents of register after the successful Subtractions.

10. What is ALU? What is its use?

Arithmetic logic unit is responsible for performing `arithmetic operations such as addition , subtraction, multiplication and logical operations such as AND , OR , NOT.

The arithmetic operations performed is based on the data type.

11. Write the rules for addition of two numbers.

Rules for binary addition

0 + 0 = 0

0 + 1 = 1

1 + 0 = 1

1 + 1 = 10_2

The first three operations produce a sum whose length is one digit but when the last operation is performed the sum is two digits

.

12. Write the rule for binary subtraction.

Rules for binary subtraction A – B :

1.Take 2's complement of B

2. Result = A + 2's complement of B

3. If carry occurs then the is +ve and carry ignored.

4. If carry not occurs the result is negative and take 2's complement of the result.

13. Discuss the principle behind the booth's multiplier.

Booth's multiplication generates a 2n bit product and treats both positive and negative numbers uniformly. The algorithm suggest that we can reduce the number of operations required for multiplication by representing multiplier as a difference between two numbers.

14. Write down the steps for and non-restoring division.

Step1: If the sign of A is + ve shift A and Q left one position and subtract divisor from A. otherwise shift A and Q left and add divisor to A.

Step2: repeat step 1 for n times.

Step3: If the sign of A is 1 add divisor to A

PART B

1. **Explain in detail about the multiplication algorithm with suitable example and diagram. (DEC'2015)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:183]

2. **Explain briefly about floating point addition and subtraction algorithm. (JUNE 2016)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:203]

3. **Design a 4-bit Carry-Look ahead Adder and explain its operation with an example.**
   Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse[Page 2.14 to 2.16]

4. **Discuss in detail about division algorithm in detail with diagram and examples. (DEC'2015)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No: 189]

5. **Explain the representation of floating point numbers in detail**
   Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse [Page 2.48 to 2.51]

6. **Explain fixed point number representation in detail.**
   Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse[Page 2-4 to 2.6]

7. **Design non restoring division and restoring division with example. (MAY' 2017)**
   Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse [Page 2-34 to 2.37 and 2- 42 to 2-44]

8. **Explain addition and subtraction of two binary numbers with suitable example.**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:178]

9. **Multiply following pair of signed numbers using Booth's bit pair recording of multiplier. A=+13 (Multiplicand) and B = - 6(Multiplier) (DEC '2014)**
   Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse[Page;2-28]

10. **Explain the sequential version of multiplication algorithm and its hardware. (MAY'2015)**
    Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse [Page 2.20 to 2.22]

11. **Explain how floating-point addition is carry out in a computer system. Give an example for a binary floating-point addition (MAY'2015)**
    Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:204]

12. **What is the disadvantage of Ripple carry addition and how it is overcome in carry look ahead adder and draw the logic circuit. (DEC'2016)**
    Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse [Page 2.12]

UNIT-III PROCESSOR AND CONTROL UNIT

PART-A

1. **What are R-type instructions? (MAY 2015)**

The arithmetic-logic instructions read operands from two registers, perform an ALU operation on the contents of the register, and write the result to a register. We call these instructions as R-type instructions.This instruction class includes add,sub,AND,OR,and slt.

For example: OR $t1, $t2, $t3 reads $t2 and $t3,
performs logical OR operations and saves the result in $t1.

2. **What is a hazard? What are its types? (DEC 2015)**

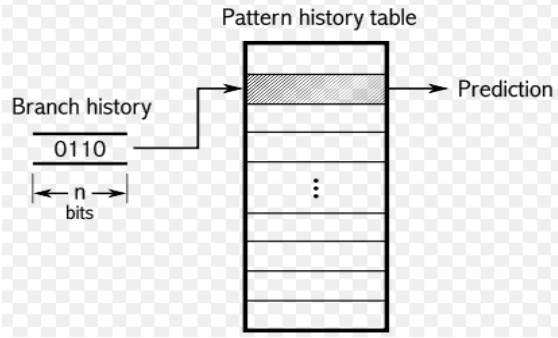
Data hazards occur when instructions that exhibit **data** dependence modify **data** in different stages of a pipeline. Ignoring potential **data hazards** can result in race conditions (also termed race **hazards**). There are three situations in which a **data hazard** can occur: read after write (RAW), a true dependency.

There are primarily three types of hazards:

i. Data Hazards
ii. Control Hazards or instruction Hazards
iii. Structural Hazards.

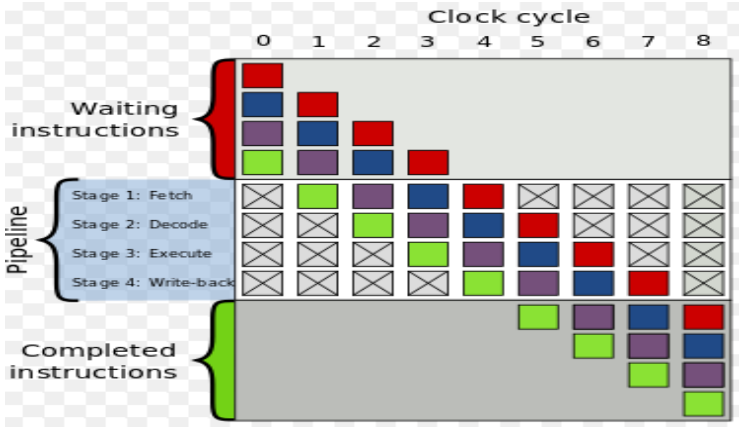
3. **What is branch prediction buffer? (MAY 2015)**

The buffer in which the recent branch information is stored is called branch target buffer. In computer architecture, a **branch predictor** is a digital circuit that tries to guess which way a **branch** (e.g. an if-then-else structure) will go before this is known definitively. The purpose of the **branch predictor** is to improve the flow in the instruction pipeline.



4. **What are the advantages of pipelining? (JUNE 2016)**

Advantages of Pipelining: The cycle time of the processor is reduced; increasing the instruction throughput. If **pipelining** is used, the CPU Arithmetic logic unit can be designed faster, but more complex.



5. **What is exception? (DEC 2014)**

Exceptions and interrupts are unexpected events that disrupt the normal flow of instruction execution. An **exception** is an unexpected event from within the processor. An interrupt is an unexpected event from outside the processor. You are to implement **exception** and interrupt handling in your multicycle CPU design.

6. **What is the need for speculation? (DEC 2014)**

Speculation (also known as **speculative** loading), is a process implemented in Explicitly Parallel Instruction Computing (EPIC) processors and their compiler s to reduce processor-memory exchanging bottlenecks or latency by putting all the data into memory in advance of an actual load instruction.

(Speculative means – rough or tentative or approximate)

7. **What is meant by pipeline bubble? (DEC 2016)**

In **computing**, a **bubble** or **pipeline** stall is a delay in execution of an instruction in an instruction **pipeline** in order to resolve a hazard. ... A **bubble** is represented in the execution stage as a NOP instruction, which has no effect other than to stall the instructions being executed in the **pipeline**.

8. **What is load word and store word instructions?**

The MIPS ISA is a load-store architecture. This means that the only operations that interact with memory are load and store.

- **load** To *load* a value from memory, you copy the data from memory into a register.
- **store** To *store* a value to memory, you copy the data from a register to memory.

We'll look at a few versions of load and store.

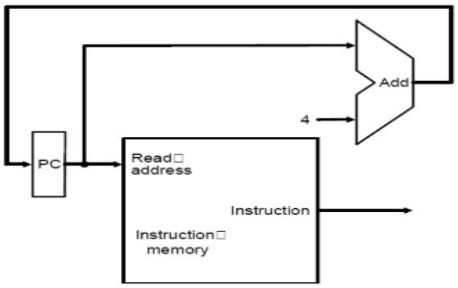
- **lw** Loads a word from a location in memory to a register. Address in memory must be word-aligned.
- **lb** Loads a byte from a location in memory to a register. Sign extends this result in the register.
- **lbu** Loads a byte (unsigned) from a location in memory to a register. Zero extends the result in the register.
- **sw** Store a word from a register to a location in memory. Address in memory must be word-aligned.
- **sb** Store the least significant byte of a register to a location in memory.

9. **What is meant by register file?**

A **register file** is an array of processor **registers** in a central processing unit (CPU). The instruction set **architecture** of a CPU will almost always **define** a set of **registers** which are used to stage data between memory and the functional units on the chip.

10. **Draw the diagram of portion of datapath used for fetching instruction?**

A Portion of the datapath used For Fetching Instruction



11. What is meant by branch target address?

In **computer architecture**, a **branch target** predictor is the part of a processor that predicts the **target** of a taken conditional **branch** or an unconditional **branch** instruction before the **target** of the **branch** instruction is computed by the execution unit of the processor. **Target** of that **branch** is computed.

12. What is meant by branch prediction? (DEC 2015)

In **computer architecture**, a **branch predictor** is the part of a processor that determines whether a conditional **branch** (jump) in the instruction flow of a program is likely to be taken or not. They allow processors to fetch and execute instructions without waiting for a **branch** to be resolved.

13. Define Hazard. Give an example for data hazard. (MAY 2105)

In the domain of central processing unit (CPU) design, **hazards** are problems with the instruction pipeline in CPU micro architectures when the next instruction cannot execute in the following clock cycle, and can potentially lead to incorrect computation results.

Data hazards

Data hazards occur when instructions that exhibit data dependence modify data in different stages of a pipeline. Ignoring potential data hazards can result in race conditions (also termed race hazards). There are three situations in which a data hazard can occur:

1. read after write (RAW), a *true dependency*
2. write after read (WAR), an *anti-dependency*
3. write after write (WAW), an *output dependency*

14. Name the control signal required to perform arithmetic operations. (MAY 2017)

The **control unit** (CU) is a component of a computer's central processing unit (CPU) that directs the operation of the processor. It tells the computer's memory, arithmetic/logic unit and input and output devices on how to respond to a program's instructions.

It directs the operation of the other units by providing timing and control signals. Most computer resources are managed by the CU. It directs the flow of data between the CPU and the other devices.

	Control signal	0	1	2	3
Reg file	RegWrite	Don't write	Write		
	$RegDst_1$, $RegDst_0$	rt	rd	$31	
	$RegInSrc_1$, $RegInSrc_0$	Data out	ALU out	IncrPC	
ALU	ALUSrc	(rt)	imm		
	Add'Sub	Add	Subtract		
	$LogicFn_1$, $LogicFn_0$	AND	OR	XOR	NOR
	$FnClass_1$, $FnClass_0$	lui	Set less	Arithmetic	Logic
Data cache	DataRead	Don't read	Read		
	DataWrite	Don't write	Write		
Next addr	$BrType_1$, $BrType_0$	No branch	beq	bne	bltz
	$PCSrc_1$, $PCSrc_0$	IncrPC	jta	(rs)	SysCallAddr

15. What is a data path? (DEC 2016)

A **data path** is a collection of functional units such as arithmetic logic units or multipliers, that perform **data** processing operations, registers, and buses. Along with the control unit it composes the central processing unit (CPU).

PART-B

1. **Why is branch prediction algorithm needed? Difference between the static and dynamic techniques. (DEC 2016)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:321]

2. **Explain how the instruction pipeline works. What are the various situations where an instruction pipeline can stall? (DEC 2016)**
   Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no:3.23-3.29]

3. **What is pipelining? Discuss about pipelined data path and control. (DEC 2016)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:272]

4. **Briefly explain about various categories of hazards with examples. (DEC 2016)**
   Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no:3.24-3.29]

5. **Explain the basic MIPS implementation with necessary multiplexers and control line. (DEC 2016)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:244]

6. **Explain how the instruction pipeline works? What are the various situations where an instruction pipeline cam stalls? Illustrate with example. (DEC 2016)**
   Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no:3.23-3.29]

7. **Explain the different types of pipeline hazards with suitable examples. (DEC 2016)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:276]

8. **Explain in detail how exceptions are handled in MIPS architecture? (DEC 2016)**
   Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no:3.49-3.50]

9. **Explain data path and its control in detail. (DEC 2016)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:286]

10. **What is hazard? Explain its types with suitable examples. (DEC 2016)**
    Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no:3.23-3.29]

11. **Discuss the modified data path to accommodate pipelined execution with a diagram. (MAY'17)**
    Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no:3.5-3.10]

12. **Explain the hazards caused by unconditional branching statements. (MAY 2017)**
    Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no:3.27-3.33]

13. **Describe operand formatting in a pipeline processor with a diagram. (MAY 2017)**
    Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no:3.40-3.42]

UNIT IV PARALLELISM

PART-A

1. **Brief about multithreading. (DEC'2014)**

In multi threading the instruction stream is divided into several streams called threads, such that the threads can be executed in parallel. Here high degree of instruction level parallelism can be achieved without increasing circuit level complexity.

2. **What is Flynn's classification? (DEC'2014)**

Parallel processing can be classified in many ways. It can be classified according to internal organization of processors according to inter connection structure used between processors or according to flow of information through the system. This classification is introduced by M.J.Flynn.

3. **Differentiate between Strong scaling and weak scaling. (MAY'2015)**

Strong scaling:

In this case the problem size stays fixed but the number of processing elements are increased. This is used as justification for programs that take a long time to run (something that is cpu-bound).

Weak scaling:

In this case the problem size (workload) assigned to each processing element stays constant and additional elements are used to solve a larger total problem (one that wouldn't fit in RAM on a single node, for example).

4. **Compare UMA and NUMA multiprocessors. (MAY'2015)**

UMA : Uniform memory access is a shared memory architecture used in parallel computers. All Processor in UMA model shares the physical memory uniformly. The access time to a memory location is independent of the processor makes the request or which memory chip contains the transferred data.

NUMA: A type of single address space multiprocessor in which some memory access are faster than others depending on which processor makes the request.

5. **What is ILP? (DEC'2015)**

ILP : Instruction level parallelism - The instructions in a sequence re independent and can be executed in parallel by overlapping is called as Instruction level parallelism.

Methods of increasing ILP:

a) By increasing depth of pipeline to overlap more instructions
b) By replicating the internal components of computer so that it can launch multiple instructions in every pipe line stage.

6. **What is fine grained multi-threading? (JUNE'2016)**

Fine grained multi threading: It is also called as interleaved multithreading. The processor executes two or more threads at a time. It switches from one thread to another at each clock cycle. During execution the thread is blocked because of data dependencies or memory latencies.

7. **Define a super scalar processor. (DEC'2015)**

Common instructions (arithmetic, load/store, conditional branch) can be initiated and executed independently.

It is applicable to RISC & CISC . Most operations are on scalar quantities

Improve the operations to get an overall improvement

8. State the need for Instruction level parallelism. (JUNE'2016)

Instruction level parallelism is needed to execute the instruction in parallel by overlapping the instruction.

Two Methods of increasing ILP:

a) By increasing depth of pipeline to overlap more instructions
b) By replicating the internal components of computer so that it can launch multiple instructions in every pipe line stage.

9. Distinguish implicit and explicit multithreading. (MAY'2017)

Implicit multi threading: It refers to the concurrent execution of multiple threads extracted from a single sequential program.

Explicit multi threading: It refers to the concurrent execution of instructions from different explicit threads either by interleaving instructions from different threads on shared pipe lines or by parallel execution on parallel pipelines.

10. What is speculation?

Speculation means that instructions are executed before the processor is certain that they are in correct execution sequence. Hence care must be taken that no processor registers or memory locations are updated until it is confirmed that these instructions should indeed be executed.

11. What is VLIW?

VLIW : Very Long Instruction Word. The example of VLIW architecture is IA -64. It places multiple instructions in single word. The operations executed in parallel are placed in the word. If it is not possible to completely fill the word with instructions those to be issued in parallel, those slots are filled with no operation.

12. List the issues which must be considered in implementation of super scalar processor.

Issues in super scalar processor:
Basic super scalar processor approach does not support multi threading.
It provides parallelism within a processor.
During some cycles not all of the available issue slots are used.
So horizontal loss occurs.

13. What is dynamic multiple issue?

In Dynamic multiple issue the scheduling is done at execution time also known as superscalar. Issue of multiple instructions in each clock cycle and requires multiple arithmetic units and register files with additional ports to avoid structural hazards.

It is generally extended to dynamic pipeline scheduling.

14. What is process and process switch?

Process : a process is an instance of a program running on a computer. The process image is collection of program data stack and attributes that define the process.

Process switch: A process switch is an operation that switches the process or control from one process to another process. It first saves all the process control data , registers and other information and then replaces them with the process with the process information for the second.

PART B

1. **Discuss about SISD, MIMD, SIMD, MISD and VECTOR systems. (MAY'2015)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No: 509].

2. **What is hardware Multithreading? Compare and contrast Fine grained multi threading and coarse grained multi threading. (MAY'2015)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:516]

3. **Explain instruction level parallel processing. State the challenges of parallel processing. (Dec'2014)**
   Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse[Page 4-4 to 4-9]

4. **Explain a processor with multiple functional units with diagram.**
   Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse[Page 4-2 to 4-3]

5. **What is the need for multi core? Explain the limitations to increase clock frequency or processor Speed.**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:503]

6. **Explain about multi core processors with diagram. (Dec'2014)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:519]

7. **Write short notes on Parallel processing challenges and Amdahl's law.**
   Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse [Page 4-11 to 4-14]

8. **Explain in detail about Flynn's classification of parallel hardware. (Dec'2015)**
   Ref: "Computer architecture" by A.P.Godse ,Dr.D.A.Godse [Page 4- 15 to 4-17].

UNIT V MEMORY AND I/O SYSTEMS

PART-A

1. **Differentiate programmed I/O and interrupt I/O. (DEC 2014)**

DMA: The use of DMA allows **interrupt**-driven IO to be used. Otherwise, a system must use **programmed I/O** if DMA is not available. When the DMA controller has completed the transfer, it will signal the CPU using an **interrupt**.

Programmed input/output (PIO) is a method of transferring data between the CPU and a peripheral, such as a network adapter or an ATA storage device.

Interrupt I/O A way of controlling **input/output** activity in which a peripheral or terminal that needs to make or receive a data transfer sends a signal that causes a program **interrupt** to be set. The processor polls the devices, in priority order, to identify the interrupting device.

2. **What is the purpose of dirty and modified bit in Cache memory? (DEC 2014)**

A **dirty bit** or **modified bit** is a **bit** that is associated with a block of computer **memory** and indicates whether or not the corresponding block of **memory** has been **modified**. **Dirty bits** are used by the CPU **cache** and in the page replacement algorithms of an operating system.

3. **What is the need to implement memory as a hierarchy? (MAY 2015)**

In computer architecture, the **memory hierarchy** separates computer storage into a **hierarchy** based on response time. **Memory hierarchy** affects performance in computer architectural design, algorithm predictions, and lower level programming constructs involving locality of reference.

4. **Define memory interleaving. (MAY 2017)**

In computing, **interleaved memory** is a design made to compensate for the relatively slow speed of dynamic random-access **memory** (DRAM) or core **memory**, by spreading **memory** addresses evenly across **memory** banks.

5. **Summarize sequence of events involved in handling an interrupt request from single device. (MAY 2017)**

Assuming that interrupts are enabled, the following is a typical scenario.

1. The device raises an interrupt request.
2. The processor interrupts the program currently being executed.
3. Interrupts are disabled by changing the control bits in the PS (except in the case of edge-triggered interrupts).
4. The device is informed that its request has been recognized, and in response, it deactivates the interrupt-request signal.
5. The action requested by the interrupt is performed by the interrupt-service routine.
6. Interrupts are enabled and execution of the interrupted program is resumed.

6. **State the advantages of virtual memory. (MAY 2016)**

The primary **benefits of virtual memory** include freeing applications from having to manage a shared **memory** space, increased security due to **memory** isolation, and being able to conceptually use more **memory** than might be physically available, using the technique of paging.

Virtual memory allows sharing of code and data, unlimited amounts of multiprogramming. We can reduce internal fragmentation using segmented paging and eliminates external fragmentation.

7. Point out how DMA can improve the I/O speed? (MAY 2015)

- DMA is a hardware controlled data transfer. It does not spend testing I/O device status and executing a number of instructions for I/O data transfer.
- In DMA transfer, data is transferred directly from disk controller to the memory location without passing through the processor or the DMA controller.
- Because of above two reasons DMA considerably improves I/O speed.

8. Define Hit ratio. (DEC 2015)

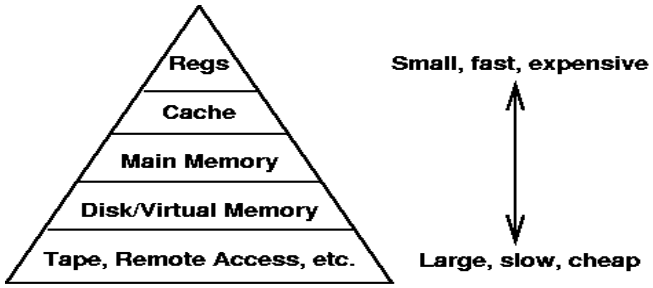
The **hit ratio** is the fraction of accesses which are a **hit**. The miss **ratio** is the fraction of accesses which are a miss. It holds that miss rate=1−**hit** rate. The (**hit**/miss) latency (AKA access time) is the time it takes to fetch the data in case of a **hit**/miss.

9. What are the various memory technologies? (DEC 2015)

With the rapid growth in the requirement for semiconductor **memories** there have been a number of **technologies** and types of **memory** that have emerged. Names such as ROM, RAM, EPROM, EEPROM, Flash **memory**, DRAM, SRAM, SDRAM, and the very new MRAM can now be seen in the electronics literature

10. Define memory hierarchy. (MAY 2016)

In computer architecture, the **memory hierarchy** separates computer storage into a **hierarchy** based on response time. **Memory hierarchy** affects performance in computer architectural design, algorithm predictions, and lower level programming constructs involving locality of reference.



11. Differentiate SRAM from DRAM.

SRAM is typically faster than **DRAM** since it doesn't have refresh cycles. Since each**SRAM** memory cell is comprised of 6 Transistors unlike a **DRAM** memory cell, which is comprised of 1 Transistor and 1 Capacitor, the cost per memory cell is far greater in an **SRAM** compared to a **DRAM**.

12. What is cache memory? (DEC 2016)

The Cache Memory is the Memory which is very nearest to the CPU , all the Recent Instructions are Stored into the Cache Memory. The Cache Memory is attached for storing the input which is given by the user and which is necessary for the CPU to Perform a Task. But the Capacity of the Cache Memory is too low in compare to Memory and Hard Disk.

Cache memory, also called CPU memory, is random access memory (RAM) that a computer microprocessor can access more quickly than it can access regular RAM. This memory is typically integrated directly with the CPU chip or placed on a separate chip that has a separate bus interconnect with the CPU.

Cache memory is smallest, fastest and costliest memory.

13. **What is meant by address mapping? (DEC2016)**

A related choice is the granularity of **address mapping**, which is **defined** as the smallest unit of addressed data (from the persistent store) that can be **mapped** independently to an area of the virtual **address** space.

14. **What is DMA? (MAY 2014)**

Direct Memory Access (DMA) is a capability provided by some computer bus architectures that allows data to be sent directly from an attached device (such as a disk drive) to the memory on the computer's motherboard. The microprocessor is freed from involvement with the data transfer, thus speeding up overall computer operation.

15. **What is meant by virtual memory? (DEC 2010)**

Virtual memory is a technique that uses main memory as a "cache" for secondary storage. Two major motivations for virtual memory: to allow efficient and safe sharing of memory among multiple programs, and to remove the programming burdens of a small, limited amount of main memory.

PART-B

1. **Discuss DMA controller with block diagram.(DEC 2016)**
   Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no:5.70-5.73]

2. **Discuss the steps involved in address translation of virtual memory with nessary block diagram. (DEC 2016)**
   Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no:5.45-5.48]

3. **Design and explain a parallel priority interrupt hardware for a system with eight interrupt sources. (DEC 2016)**
   Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no:5.68-5.69]

4. **Define cache memory? Explain the various mapping techniques associated with cache memories. (MAY 2016)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:383,398-406]

5. **Explain about DMA controller, with the help of a block diagram. (MAY 2016)**
   Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no:5.72-5.73]

6. **What is virtual memory? Explain in detail about how virtual memory is implemented with neat diagram? (DEC 2015)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:427-430]

7. **Draw the typical diagram of a DMA controller and explain how it is used for direct data transfer between memory and peripherals? (DEC 2015)**
   Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no:5.72-5.73]

8. **Elaborate on the various memory technologies and its relevance. (MAY 2015)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:378-383]

9. **What is virtual memory? Explain the steps involved in virtual memory address translation. (MAY 2015)**
   Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:427-430]

10. **Draw different memory address layouts and brief about the technique used to increase the average rate of fetching words from the main memory. (DEC 2014)**
    Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no: 5.79-5.82]

11. **Explain in detail about any two standard input and output interfaces required to convert the I/O device to the bus. (DEC 2014)**
    Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no: 5.57-5.62]

12. **Explain the different mapping functions that can be applied an cache memories in details. (MAY 2017)**
    Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no: 5.57-5.62]

13. **Explain virtual memory address translation in detail with necessary diagrams. (MAY 2017)**
    Ref:"Computer Organization and Design" by David.A.Patterson, John L.Hennessy [Page No:427-430]

14. **Explai in detail about the Bus Arbitration techniques in DMA. .(MAY 2017)**
    Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no: 5.79-5.81]

15. **What is meant by Direct Memory Access? Explain the use of DMA controllers in a computer system. (MAY 2017)**
    Ref: "Computer Architecture" By A.P.Godse,Dr.D.A.Godse [Page.no: 5.70-5.79]

ANNA UNIVERSITY PREVIOUS YEAR QUESTION PAPERS

B.E/B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Sixth Semester

Electronics and Communication Engineering

CS 6303 – COMPUTER ARCHITECTURE

(Common to Information Technology)

(And also common to Fifth Semester Elective – Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Fifth Semester – Robotics and Automation Engineering and Third Semester Computer Science and Engineering)

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. How to represent Instruction in a Computer System ?
2. Distinguish between auto increment and auto decrement addressing mode.
3. Define ALU.
4. What is Subword Parallelism ?
5. What are the advantages of pipelining ?
6. What is Exception ?
7. State the need for Instruction Level parallelism.
8. What is Fine grained Multithreading ?
9. Define Memory hierarchy.
10. State the advantages of virtual memory.

04-06 **1** **57241**

PART – B (5 × 16 = 80 Marks)

11. (a) Discuss about the various components of a computer system. **(16)**

OR

(b) Elaborate the different types of addressing modes with a suitable example. **(16)**

12. (a) Explain briefly about floating point addition and Subtraction algorithms. **(16)**

OR

(b) Define Booth Multiplication algorithm with suitable example. **(16)**

13. (a) What is pipelining ? Discuss about pipelined data path and control. **(16)**

OR

(b) Briefly explain about various categories of hazards with examples. **(16)**

14. (a) Explain in detail about Flynn's classification. **(16)**

OR

(b) Write short notes on : **(16)**

(i) Hardware multithreading

(ii) Multicore processors.

15. (a) Define Cache Memory ? Explain the Various Mapping Techniques associated with cache memories. **(16)**

OR

(b) Explain about DMA controller, with the help of a block diagram. **(16)**

B.E. / B.TECH DEGREE EXAMINATION,NOV/ DEC 2016

Third Semester

Computer Science and Engineering

CS6303 – COMPUTER ARCHITECTURE

(Regulation 2013)

Answer All Questions

Part A – (10 X 2 = 20 marks)

1. What is an instruction register?
2. Give the formula for CPU execution time for a program.
3. What is a guard bit and what are the ways to truncate the guard bit?
4. What is arithmetic overflow?
5. What is meant by pipeline bubble?
6. What is a data path?
7. What is instruction level parallelism?
8. What is multithreading?
9. What is meant by addressing mapping?
10. What is cache memory?

Part B – (5 X 13 = 65 marks)

11. A) Explain in detail the various components of computer system with neat diagram.

Or

b) Explain the different types of addressing modes with examples.

12. a) Explain booths algorithm for multiplication of signed two's complement number.

Or

b) Discuss in detail about division algorithm with diagram and examples.

13. a) Why is branch prediction algorithm needed? Differentiate the static and dynamic techniques.

Or

b) Explain how instruction pipeline works? What are the various situation where an instruction pipeline can stall?

14. a) Explain in detail about Flynn's classification of parallel hardware.

Or

b) Discuss shared memory multiprocessor with a neat diagram.

15. a) Discuss DMA controller with diagram.

Or

b) Discuss the steps involved in three address translation of virtual memory with necessary block diagram.

Part C – (1 X 15 = 15 marks)

16. a) What is the disadvantage of Ripple carry addition and how it is overcome in carry look ahead adder and draw the logic circuit.

Or

b) Design and explain parallel priority interrupt hardware for a system with eight interrupts sources.

SYLLABUS

CS6551 COMPUTER NETWORKS L T P C

3 0 0 3

UNIT I FUNDAMENTALS & LINK LAYER 9

Building a network – Requirements – Layering and protocols – Internet Architecture – Network software – Performance; Link layer Services – Framing – Error Detection – Flow control.

UNIT II MEDIA ACCESS & INTERNET WORKING 9

Media access control – Ethernet (802.3) – Wireless LAN' s – 802.11 – Bluetooth – Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP, ICMP)

UNIT III ROUTING 9

Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM)

UNIT IV TRANSPORT LAYER 9

Overview of Transport layer – UDP – Reliable byte stream (TCP) – Connection management – Flow control – Retransmission – TCP Congestion control – Congestion avoidance (DECbit, RED) – QoS – Application requirements

UNIT V APPLICATION LAYER 9

Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS – SNMP

TOTAL PERIODS: 45

TEXT BOOKS:

T1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011

REFERENCES:

R1. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.

R2. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.

R3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", Mc Graw Hill Publisher, 2011.

R4. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw – Hill,2011.

UNIT-I FUNDAMENTALS & LINK LAYER

PART-A

1. **How do layers of the internet model correlate to the layers of the OSI model?**

OSI	TCP/IP
Physical Layer	Physical Layer
Data Link Layer	Network Access Layer
Network Layer	IP Layer
Transport Layer	TCP Layer
Session Layer	Application Layer
Presentation Layer	
Application layer	

2. **Why is flow control and error control duplicated in different layers?**

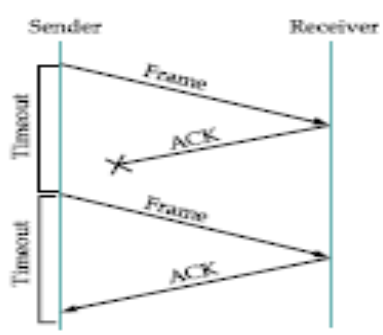
Like the data link layer, the transport layer is responsible for flow and error control. Flow control and error control at data link layer is node-to-node level. But at transport layer, flow control and error control is performed end-end rather than across a single link.

3. **What are the three criteria necessary for an effective and efficient network?**

The most important criteria are performance, reliability and security. **Performance** of the network depends on number of users, type of transmission medium, the capabilities of the connected h/w and the efficiency of the s/w. **Reliability** is measured by frequency of failure, the time it takes a link to recover from the failure and the network's robustness in a catastrophe. **Security** issues include protecting data from unauthorized access and viruses.

4. **What would happen if the acknowledgement to the original packet is lost? Draw the timeline for this scenario?**

If the sender does not receive an acknowledgment after a reasonable amount of time, then it *retransmits* the original frame. This action of waiting a reasonable amount of time is called a *timeout*. The general strategy of using acknowledgments and timeouts to implement reliable delivery is sometimes called *automatic repeat request* (normally abbreviated ARQ). The timeline for this scenario is given below.



5. **How performance of the computer network is measured? (May/June 2016)**

Network performance is measured in two fundamental ways: *bandwidth* (also called *throughput*) and *latency* (also called *delay*). The bandwidth of a network is given by the number of bits that can be transmitted over the network in a certain period of time. Latency corresponds to how long it takes a message to travel from one end of a network to the other.

6. Discuss about socket.

A socket is the point where a local application process attaches to the network, i.e a network socket is an internal endpoint for receiving or sending data at a single node in a computer network. A socket is bound to a port number so that the TCP layer can identify the application that data is destined to be sent to. An end point is a combination of an IP address and a port number.

7. What are the features provided by layering?

- It decomposes the problem of building a network into more manageable components. Rather than implementing a monolithic piece of software that does everything implement several layers, each of which solves one part of the problem.
- It provides more modular design. To add some new service, it is enough to modify the functionality at one layer, reusing the functions provided at all the other layers.

8. List the two interfaces provided by protocols?

- Service interface -defines the operations that local objects can perform on the protocol.
- Peer interface -defines the form and meaning of messages exchanged between protocol peers to implement the communication service.

9. What are the issues in data link layer? (Nov/Dec 2015)

The data link layer has a number of specific functions it can carry out. These functions include

a) Providing a well-defined service interface to the network layer.
b) Dealing with transmission errors.
c) Regulating the flow of data so that slow receivers are not swamped by fast senders.

10. Demonstrate your understanding of character stuffing.

Character stuffing is the technique used to overcome problem of BYSYNC protocol's frame having special character in the data field by inserting same special character before it.

11. What do you mean by flow control? (May/June 2016, May/June 2015)

Flow control is a technique for assuring that a transmitting entity does not overwhelm a receiving entity with data. It is a feedback mechanism by which the receiver is able to regulate the sender. Such a mechanism is used to keep the sender from overrunning the receiver, i.e., from transmitting more data than the receiver is able to process.

12. Compare and contrast Unicast, Multicast, and Broadcast. (Nov/Dec 2016)

- Unicasting: Transmitting data from a single sender to a single receiver.
- Broadcasting: Transmitting data from a single source to all the other nodes in the network
- Multicasting: Transmitting data from a single source to a group of destination nodes

13. Differentiate bridge and switch. (May/June 2012)

Bridge: A bridge goes one step up on a hub in that it looks at the destination of the packet before sending. If the destination address is not on the other side of the bridge it will not transmit the data. A bridge only has one incoming and one outgoing port.

Switch: A switch has multiple ports. When a packet comes through a switch it is read to determine which computer to send the data to. This leads to increased efficiency in that packets are not going to computers that do not require them.

14. How the two- dimensional parity is used in error detection?

Two-dimensional parity check increases the likelihood of detecting burst errors. It is used to detect errors occurred in more than one bits.

PART-B

1. **Discuss in detail about the layers in OSI model. (Nov/Dec 2016)**
   (PageNo:37-41, Computer Networks by Andrew S.Tanenbaum, Pearson Education, Fourth Edition)

2. **Discuss in detail about the Byte- oriented Protocols (PPP), Bit-oriented Protocols (HDLC) and SONET. (May/June 2016)**
   (Page No:83-91, Text Book)

3. **Explain sliding window flow control and stop and wait flow control in detail. (Nov/Dec 2015)**
   (Page No:103-111, Text Book)

4. **Summarize the requirements of building a network? (April/May 2017)**
   (Page No:06-24, Text Book)

5. **Discuss how performance of computer network is measured? (Nov/Dec 2016)**
   (PageNo:44-53, Text Book)

6. **Assume that a frame consists of 6 characters encoded in 7-bit ASCII. Attach a parity bit for every character to maintain even parity. Also attach a similar parity bit for each bit position across each of the bytes in the frame. Show that such a 2-dimensional parity scheme can detect all 1-bit, 2-bit and 3-bit errors and can correct a single bit error. (May/June 2013)**
   (Page No:93-94, Text Book)

7. **Suppose we want to transmit the message 11001001 and protect it from errors using the CRC polynomial x^3+1. Use polynomial long division to determine the message that should be transmitted. (May/June 2013)**
   (Page No:97-102, Text Book)

8. **What is the need for error detection? Explain the typical examples. Explain the methods for error detection and error correction. (May/June 2016) (April/May 2015)**
   (Page No: 91-102, Text Book)

9. **Explain about internet architecture. (April/May 2015)**
   (Page No: 33-36 Text Book)

10. **Discuss the principle of stop and wait flow control algorithm. Draw time line diagrams and explain how loss of a frame and loss of an ACK are handled. What is the effect of delay-bandwidth product on link utilization? (Nov/Dec 2015)**
    (Page No:103-111, Text Book)
11. **Draw the OSI network architecture and explain the functionalities of every layer in details (Nov/Dec 2016) (Nov/Dec 2015)**

(PageNo:37-41, Computer Networks by Andrew S.Tanenbaum, Pearson Education, Fourth Edition)

12. **Suppose we want to transmit the message 11001001 and protect it from errors using the CRC polynomial $x^3 + 1$.**
    i) **Use polynomial long division to determine the message that should be transmitted.**
    ii) **Suppose the leftmost bit of the message is inverted due to noise on the transmission link. What is the result of the receiver's CRC calculation? How does the receiver that an error has occurred? (May/June 2013)**

(Page No:97-102, TextBook)

13. **Write short notes on:**
    (i) Reliable transmission (Page No: 102-111, TextBook)
    (ii) Framing. (Page No: 81-82, TextBook)

UNIT-II MEDIA ACCESS & INTERNET WORKING

PART-A

1. **Mention the different types of bridge. What are the limitations of bridges?**
   Simple Bridge- connects two LAN
   Multi port Bridge- connect more than 2 LANs
   Transparent Bridge- it learns on its own about connected LANs.
   The limitations of bridges: Scalability and Heterogeneity.

2. **How does a given bridge learn whether it should forward a multicast frame over a given port?**
   It learns exactly the same way that a bridge learns whether it should forward a unicast frame over a particular port- by observing the source addresses that it receives over that port.

3. **How is the minimum size of an Ethernet frame determined? (May/June 2013)**
   Minimum Frame Size = 2 * Maximum distance *(data rate / propagation speed)

4. **What do you understand by CSMA protocol? (April/May 2015)**
   Carrier sense multiple access (CSMA) is a media access control (MAC) protocol in which a node verifies the absence of other traffic before transmitting on a shared transmission medium. Carrier sense means that a transmitter attempts to determine whether another transmission is in progress before initiating a transmission. If a carrier is sensed, the node waits for the transmission in progress to end before initiating its own transmission. In other words, CSMA is based on the principle "sense before transmit". Multiple access means that multiple nodes may send and receive on the medium. Transmissions by one node are generally received by all other nodes connected to the medium.

5. **How many network addresses and host addresses are supported by class A, class B networks?**
   Class A: Number of networks = 127
   Number of hosts = 224 -1
   Class B: Number of networks = 214 -1
   Number of hosts = 216 – 1 = 65,535

6. **Discuss the scaling concerns that the CIDR addresses.**
   Classless interdomain routing (CIDR, pronounced “cider”) is a technique that addresses two scaling concerns in the Internet: the growth of backbone routing tables as more and more network numbers need to be stored in them, and the potential for the 32- bit IP address space to be exhausted well before the 4 billionth host is attached to the Internet.

7. **Differentiate Physical Address and Logical Address. (May/June 2014)**

Physical Address	Logical Address
It is implemented by data link layer	It is implemented by n/w layer
It contains 48 bits	It contains 32 bits
It is a local addressing system	It is an universal address system
Another name is MAC address	Another name is IP address
It is flat in nature	Hierarchical in nature
Does not give any clue for routing	Its structure gives clue for routing

8. List the functions of a Bridge? (April/May 2015)

A bridge should have enough buffer space to store the frames until it is transmitted.
It should be able to distinguish addresses of host on different LAN.
It can contain information about other bridges.
It should follow congestion control mechanisms to overcome congestion.
It works at layer 1 and layer 2.

9. Mention some of the physical properties of Ethernet. (May/June 2014)

Implemented on coaxial cable of up to 500 meters in length

- Hosts connect by —tapping into it. Taps at least 2.5 meters apart
- Transceiver is small device directly attached to tap

Detects when line is idle and drives signal when host is transmitting

- All protocol logic implemented in the adaptor (not transceiver)

10. Why Ethernet is said to be a 1-persistent protocol?

An adaptor with a frame to send transmits with probability '1'whenever a busy line goes idle is called I-persistent protocol.

11. What is the need for ARP? (Nov/Dec 2015)

- The address resolution protocol (arp) is a protocol used by the Internet Protocol (IP), to map IP network addresses to the hardware addresses used by a data link protocol.
- The protocol operates below the network layer as a part of the interface between the OSI network and OSI link layer.
- Address resolution refers to the process of finding an address of a computer in a network

12. Define hidden node problem. (May/June 2016)

Consider the situation depicted, where A and C are both within range of B but not each other. Suppose both A and C want to communicate with B and so they each send it a frame. A and C are unaware of each other since their signals do not carry that far. These two frames collide with each other at B, but unlike an Ethernet, neither A nor C is aware of this collision. A and C are said to be *hidden nodes* with respect to each other and this problem is called hidden node problem.

13. What are the functions of MAC?

MAC sub layer resolves the contention for the shared media. It contains synchronization, flag, flow and error control specifications necessary to move information from one place to another, as well as the physical address of the next station to receive and route a packet.

14. Find the network Address in a class A subnet with the IP address of one of the hosts as 25.34.12.56 and mask 255.255.0.0? (Nov/Dec 2015) (May/June 2014)

IP Address	-	25.34.12.56
Mask	-	255.255.0.0
Network Address	-	25.34.0.0

PART-B

1. **Explain in detail about the access method and frame format used in Ethernet and token ring. (Apr/May 2015)**
   (Page No: 372-375, & 386-391 ReferanceBook4)

2. **(i) Discuss the MAC Layer functions of IEEE 802.11. (April/May 2015)**
   (ii) Discuss Key requirements of wireless LAN. (April/May 2015)
   (PageNo:295-299, Computer Networks by Andrew S.Tanenbaum, Pearson Education, Fourth Edition)
   (PageNo:292-302, Computer Networks by Andrew S.Tanenbaum, Pearson Education, Fourth Edition)

3. **How would you describe about Bluetooth and explain with neat sketch about its architecture?**
   (PageNo:310-316, Computer Networks by Andrew S.Tanenbaum, Pearson Education, Fourth Edition)

4. **Explain in detail about the IP service model and global addressing of Internet Protocol. (Nov/Dec 2016)**
   (Page No: 206-216, TextBook)

5. **Write short notes on Bridges and Switches. (May/June 2014)**
   (Page No: 189-203,TextBook)

6. **(i) Explain in detail about Address Resolution Protocol. (Nov/Dec 2015)**
   (ii) Brief about Bridges and switches.
   (Page No: 228-239,TextBook)
   (Page No: 616-627,ReferenceBook4)

7. **Discuss the problems encountered in applying CSMA/CD algorithm to wireless LANs. How do 802.11 specifications solve these problems?**
   (Page No: 135-142,TextBook)

8. **How will you describe the Physical properties of Ethernet (802.3)? Detail your answer with neat illustration?**
   (Page No: 119-122,TextBook)

9. **Describe in detail about access protocols in IEEE802.3 Ethernet. (Nov/Dec 2016)**
   (Page No: 122-127,TextBook)

10. **Give the comparison between different wireless technologies. Enumerates 802.11 protocol stacks in detail. (May/June 2016)**
    (Page No: 128-148,TextBook)

11. **Write notes on: (May/June 2016) (Nov/Dec 2015)**
    i. **DHCP**
    ii. **ICMP**
    (Page No: 231-235,TextBook)
    (Page No: 235-240,TextBook)

12. **Determine the maximum distance between any pair of stations in a CSMA/CD network with a data rate of 10 Mbps, for the correct operation of collision detection process, assuming the minimum frame size to be 512 bits. What should be the maximum distance if the data rate is increased to 1 Gbps? 2 stations A and B, connected to the opposite ends of a 10-Mbps CSMA/CD network, start transmission of long frames at times t_1 = 0µs and t_2= 3µs respectively. Determine the instants when A hears the collision and B hears the collision, Signal propagation speed may be assumed as $2x10^8$ m/s. (April/May 2017)**
    (Refer Page No: 135-142,TextBook)
    (Hint: minimum frame size = bandwidth *delay (rtt)
    propagation delay = round trip time/2
    Maximum Distance = propagation delay*Propagation Speed)

13. **Describe the transmitter algorithm implemented at the sender side of the Ethernet protocol. Why should Ethernet frame should be 512 bytes long.**
    (Page No: 124-127,TextBook)

UNIT-III ROUTING

PART-A

1. **What are the metrics used by routing protocols? (April/May 2015)**

Routing use Routers use various metrics and calculations to determine the best route for a packet to reach its final network destination. Each routing protocol uses its own algorithm with varying weights to determine the best possible path

The following are metrics used in determining the best path for a routing protocol:

- **Bandwidth** – Throughput speed in bits per second
- **Cost** – An arbitrary value assigned by an administrator for the intersecting of networks
- **Delay** – Network latency caused by such factors as distance or congestion
- **Hop Count** – The number of routers (hops) a packets passes through to its destination
- **Load** – Measurement of traffic that flows through a router
- **MTU** (Maximum Transmission Unit) – The largest unit size allowed to be transmitted on all routes from source to destination
- **Reliability** – Represents the amount of network downtime, that is, how reliable a network path is)
- **Ticks** – Measurement of delay, where is tick is 1/18 of a second. A tick is used as part of the routing protocol IPX RIP

2. **Compare circuit switching and virtual circuit based packet switching, in respect of queuing and forwarding delays. (May/June 2013)**

- Queuing delay of a packet is the waiting time in the output buffers (input queue in some case)
- Circuit-switched networks do not have forward delays or Queuing delays
- In Virtual Circuit networks, Queuing delay is variable, i.e., it depends on the backlog in the node due to other traffic.
- Variable queuing delay is what makes analysis of packet network.

3. **Define Reliable Flooding**

It is the process of making sure that all the nodes participating in the routing protocol get a copy of the link state information from all the other nodes.

4. **Differentiate forwarding and routing.**

Forwarding consists of taking a packet, looking at its destination address, consulting a table, and sending the packet in a direction determined by that table. Forwarding is a relatively simple and well-defined process performed locally at a node.

Routing is the process by which forwarding tables are built. Routing depends on complex distributed algorithms that have continued to evolve throughout the history of networking.

5. **Write the types of connecting devices in internetworking. (May/June 2016)**

Repeaters: A repeater is an electronic device that operates on only the physical layer of OSI model and allows us to extend only the physical length of a network.

Bridges: operates in the physical and data link layers of OSI model and relay frames between two originally separate LANs.

Routers: Operates in the physical, data link and network layers of OSI model and relay Packets among multiple interconnected networks.

Gateways: Potentially operates on all seven layers of the OSI model. A gateway is a protocol converter. It can accept a packet formatted for one protocol and convert it to a packet formatted for another protocol.

6. Define VCI. (Nov/Dec 2016)

A Virtual Circuit Identifier that uniquely identifies the connection at this switch, and which will be carried inside the header of the packets that belongs to this connection.

7. What is fragmentation and reassembly? (Nov/Dec 2016)

A router, when it receives a datagram that it wants to forward over a network that has an Maximum Transmission Unit(MTU) that is smaller than the received datagram will be divided in to number of smaller datagram of size well below the MTU. To enable these fragments to be reassembled at the receiving host, they all carry the same identifier in the Ident field. This identifier is chosen by the sending host and is intended to be unique among all the datagrams that might arrive at the destination from this source over some reasonable time period. Since all fragments of the original datagram contain this identifier, the reassembling host will be able to recognize those fragments that go together.

8. What are the salient features of IPV6?

The following are the features of the IPv6 protocol:

- New header format
- Large address space
- Efficient and hierarchical addressing and routing infrastructure
- Stateless and stateful address configuration
- Built-in security
- Better support for quality of service (QoS)
- New protocol for neighboring node interaction
- Extensibility

9. List the difference between Circuit switching Packet switching. (April/May 2017)

- Circuit switching is done at physical layer whereas datagram switching is generally done at network layer.
- Circuit switching requires the resources to be reserved before the transmission of data but datagram switching doesn‘t require such reservation of resources.
- In circuit switching, whole of the data travels along a single dedicated path between the two terminals whereas in datagram switching data is divided into packets and each of these packets are treated independently and travel along different paths, source and destination being the same.

10. Explain Load Balancing.

Load Balancing is method of allowing multiple routes to the same place with the same cost will cause traffic to be distributed evenly over those routes.

11. What is the function of a router?

- Routers relay packets among multiple interconnected networks. They route packets from one network to any of a number of potential destination networks on internet. A router operates on the physical, data link and network layer of the OSI model. A router is termed as an intelligent device. Therefore, its capabilities are much more than those of a repeater or a bridge.
- A router is useful for interconnecting two or more heterogeneous networks that differ in their physical characteristics such as frame size, transmission rates, topologies, addressing etc. A

router has to determine the best possible transmission path among several available paths. Destination, Cost and Next Hop are the important fields in a routing table.

12. Compare IPv4 and IPv6

IPV4	IPV6
A 32-bit numeric address in IPv4 is written in decimal as four numbers separated by periods. Each number can be zero to 255.	IPv6 addresses are 128-bit IP address written in hexadecimal and separated by colons.
For example, **1.160.10.240** could be an IP address.	An example IPv6 address could be written like this: **3ffe:1900:4545:3:200:f8ff:fe21:67cf**

13. Define count to infinity problem.

No router ever has a value more than one higher than the minimum of all its neighbors. Gradually, all routers work their way up to infinity, but the number of exchanges required depends on the numerical value used for infinity. If the metric is time delay, there is no well defined upper bound, so high value is needed to prevent a path with a long delay from being treated as down. This situation is known as count to infinity problem.

14. Mention any four applications of multicasting.

- Broad casts of audio and video
- videoconferencing
- Shared Applications.
- IGMP is used by multicast routers to keep track of membership in a multicast group.

PART-B

1. **With the neat sketches, write down the algorithm of link state routing and explain the same.**
   (Page No: 252-262,TextBook)

2. **Explain about the inter domain routing (BGP) routing algorithms.**
   (Page No: 313-324,TextBook)

3. **Describe about IPV6 and compare IPV4 and IPV6. (May/June 2016)**
   (Page No: 324-338,TextBook)

4. **Explain the Routing Information Protocol/Distance Vector routing in detail and mention the limitation of the same. (May/June 2016) (Nov/Dec 2015)**
   (Page No: 244-252,TextBook)

5. **Compare and contrast different types switching methodologies.**
   (Page No: 431-447, ReferanceBook4)

6. **Explain in detail about two types Multicast Routing with suitable examples. (Nov/Dec 2016) (April/May 2015)**
   (Page No:3 41-354TextBook)

7. **Describe in detail about the OSPF with neat diagrams. (Nov/Dec 2016) (Nov/Dec 2015) (April/May 2017)**
   (Page No: 259-262,TextBook)

8. **Summarize the basics of BGP and common AS relationship and policies?**
   (Page No: 313-324,TextBook)

9. **Explain in detail about different types switching methodologies.**
   (Page No: 431-447, ReferanceBook4)

10. **Write short notes on: (Nov/Dec 2016) (April/May 2015)**
    - **i) DVMRP**
    - **ii) PIM**

    (Page No: 341-348,TextBook)

11. **Explain the Distance Vector routing (RIP) in detail and mention the limitation of the same.**
    (Page No: 244-252,TextBook)

12. **i) Describe in detail about Switching and Forwarding.**
    ii) Discuss the challenges in inter-domain routing.
    (Page No: 431-447, ReferanceBook4)
    (Page No: 314-317,TextBook)

UNIT-IV TRANSPORT LAYER

PART-A

1. **Give the processes involved in Slow Start. (May/June 2016)**

   Slow-start algorithm is part of the congestion control in TCP, designed to avoid sending more data than the network is capable of transmitting. Slow-start algorithm works by increasing the TCP Window by one segment for each acknowledged segment. This behavior effectively doubles the TCP Window size each round trip of the network

2. **How does transport layer perform duplication control? (April/May 2015)**

   It is possible for packets to be duplicated in packet switched network; therefore TCP keeps track of bytes received in order to discard duplicate copies of data that has already been received.

3. **What do you mean by Qos? (Nov/Dec 2015)**

   Quality of Service is used in some organizations to help provide an optimal end user experience for audio and video communications. Qos is most commonly used on networks where bandwidth is limited and a large number of network packets competing for a relatively small amount of available bandwidth.

4. **List the approaches to improve the QoS. (May/June 2011)**

   The techniques to improve QoS are
   - Scheduling
   - Traffic shaping
   - Resource reservation
   - Admission control

5. **How can the effect of jitter be compensated? What type of applications requires this compensation?**

   Jitter is defined as a variation in the delay of received packets. Jitter can be compensated by using play out delay buffers. The play out delay buffer must buffer these packets and then play them out in a steady stream. Application : Real time control systems

6. **What are the two categories of QoS attributes? (April/May 2015)**

   The two categories of QoS Attributes are User Oriented and Network Oriented.

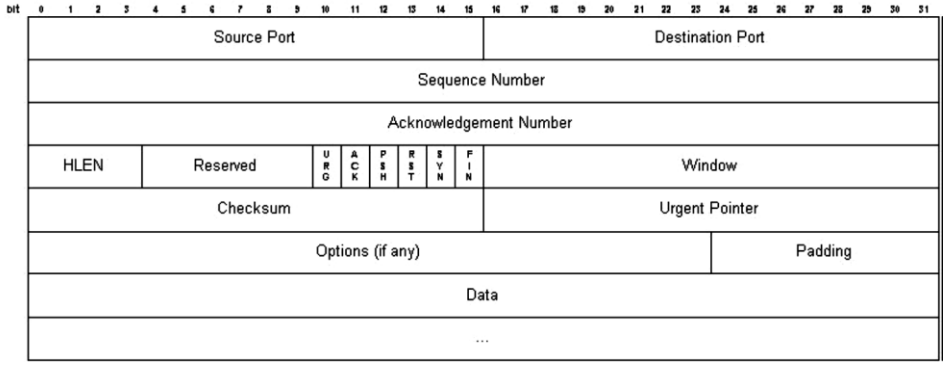
   User related attributes: Sustainable Cell Rate (SCR), Peak Cell Rate (PCR), Minimum Cell Rate (MCR), Cell Variation Delay Tolerance (CVDT)

   The network related attributes: Cell loss ratio (CLR), Cell transfer delay (CTD), Cell delay variation (CDV), Cell error ratio (CER).

7. **Suppose TCP operates over a 1-Gbps link, utilizing the full bandwidth continuously. How long will it take for the sequence numbers to wrap around completely? Suppose an added 32-bit timestamp field increments 1000 times during this wrap around time, how long it will take timestamp filed to wrap around?**

   Once a segment with sequence x survives in Internet, TCP cannot use the same sequence no. How fast 32-bit sequence no space can be consumed? 32-bit sequence no is adequate for today's network. Wrap Around Time for T3-45Mbps (2^{32} x 8) /45Mbps=763.55sec=12.73 min.

8. Draw the TCP header format. (May/June 2012)



9. What are the three events involved in the connection? (May/June 2016)

For security, the transport layer may create a connection between the two end ports. A connection is a single logical path between the source and destination that is associated with all packets in a message. Creating a connection involves three steps:

- Connection establishment
- Data transfer
- Connection release

10. List the four aspects related to the reliable delivery of data? (May/June 2012)

The four aspects are Error control, Sequence control, Loss control and Duplication control.

11. Define Congestion Control.

Congestion in a network occurs if user sends data into the network at a rate greater than that allowed by network resources. Any given node has a number of I/O ports attached to it. There are two buffers at each port, one to accept arriving packets & another one to hold packets that are waiting to depart. If packets arrive too fast node than to process them or faster than packets can be cleared from the outgoing buffers, then there will be no empty buffer. Thus causing congestion and traffic in the network.

12. What are the advantages of using UDP over TCP? (May/June 2014)

UDP is very useful for audio or video delivery which does not need acknowledgement. It is useful in the transmission of multimedia data. Connection Establishment delay will occur in TCP.

13. Why TCP services are called Stream delivery services?

TCP allows the sending process to deliver data as a stream of bytes and the receiving process to deliver data as a stream of bytes. so it is called as stream of bytes.

14. Name the policies that can prevent (avoid) congestion.

DEC (Digital Equipment Corporation) bit.
Random Early Detection (RED).
Source based congestion avoidance.
The congestion may be avoided by two bits:
BECN - Backward Explicit Congestion Notification
FECN - Forward Explicit Congestion Notification.

PART-B

1. **Describe with examples the three mechanisms by which congestion control is achieved in TCP (May/June 2016) (Nov/Dec 2016) (Nov/Dec 2015)**
   (Page No: 499-514,TextBook)

2. **Define UDP. Discuss the operation of the UDP. Explain UDP checksum with one example. (May/June 2016)**
   (Page No: 393-396,TextBook)

3. **With neat architecture, explain TCP in detail. (Nov/Dec 2015) (April/May 2015)**
   (Page No: 396-430,TextBook)

4. **What is meant by QoS in networking? Explain the techniques to improve QoS.**
   (Page No: 530-537,TextBook)

5. **Describe how reliable and ordered delivery is achieved through TCP.**
   (Page No: 408-412,TextBook)

6. **Discuss TCP congestion avoidance algorithm in detail.**
   (Page No: 514-530,TextBook)

7. **With neat architecture, explain UDP and its packet format. (May/June 2016)**
   (Page No: 393-396,TextBook)

8. **(i) With the help of a network diagram, explain how TCP manages a byte stream. Give an example. (Nov/dec 2016)**
   (ii)Explain any one congestion control algorithm (May/June 2016)
   (Page No: 396-400,TextBook)
   (Page No: 499-514,TextBook)

9. **Explain connection establishment and connection closing in TCP. (April/May 2015)**
   (Page No: 402-407,TextBook)

10. **Discuss the different Queuing Discipline in detail.**
    (Page No: 492-499,TextBook)

11. **Explain adaptive flow control in detail and its uses. (April/May 2017)**
    (Page No: 409-422,TextBook)

12. **Write short notes on: (i) DECbit, (ii) RED. (April/May 2017)**
    (Page No: 514-530,TextBook)

UNIT-V APPLICATION LAYER

PART-A

1. **Why do we need a Domain Name System? What role does the DNS Resolver play in the DNS system? (Nov/Dec 2012)**

Domain Name System can map a name to an address and conversely an address to name. The Domain Name System converts domain names into IP numbers. IP numbers uniquely identify hosts on the Internet: however, they are difficult to remember. We therefore need a memorable way of identifying hosts. A DNS Resolver is responsible for making requests of the local DNS server in behalf of clients. A DNS Resolver must know the IP address of at least one DNS server. It uses this address to start the DNS Lookup process.

2. **What are the four main properties of HTTP?**

- Global Uniform Resource Identifier.
- Request-response exchange.
- Statelessness.
- Resource metadata

3. **Why is an application such as POP needed for electronic messaging? (Apr/May 2012)**

Workstations interact with the SMTP host, which receives the mail on behalf of every host in the organization, to retrieve messages by using a client-server protocol such as Post Office Protocol, version 3(POP3). Although POP3 is used to download messages from the server, the SMTP client still needed on the desktop to forward messages from the workstation user to its SMTP mail server.

4. **What is use of digital signature?**

Digital signature is a method to authenticate the sender of a message. It is similar to that of signing transactions documents when you do business with a bank. In network transactions, you can create an equivalent of an electronic or digital signature by the way you send data.

5. **Describe the message format of SMTP?**

Message format of SMTP have two parts: a *header* and a *body*. Both parts are represented in ASCII text. Originally, the body was assumed to be simple text, but it has been augmented by MIME to allow the message body to carry all sorts of data. This data is still represented as ASCII text, but because it may be an encoded version of, say, a JPEG image, it's not necessarily readable by human users.

6. **List the five types of HTTP result codes?**

Code	Type	Example Reasons
1xx	Informational	Request received, continuing process
2xx	Success	Action successfully received, understood, and accepted
3xx	Redirection	Further action must be taken to complete the request
4xx	Client error	Request contains bad syntax or cannot be fulfilled
5xx	Server error	Server failed to fulfill an apparently valid request

7. **Analyze the importance of SNMP. (Nov/Dec 2011)**

A network is a complex system, both in terms of the number of nodes that are involved and in terms of the suite of protocols that can be running on any one node. All the state that is maintained and

manipulated on any one of those nodes—for example, address translation tables, routing tables, TCP connection state, and so on are becomes difficult task. Since the nodes we want to keep track of are distributed, our only real option is to use the network to manage the network. This means we need a protocol that allows us to read, and possibly write, various pieces of state information on different network nodes. The most widely used protocol for this purpose is the Simple Network Management Protocol (SNMP).

8. How does MIME enhance SMTP?

MIME is a supplementary protocol that allows non-ASCII data to be sent through SMTP. MIME transforms non-ASCII data at the sender site to NVT ASCII data and deliverers it to the client SMTP to be sent through the Internet. The server SMTP at the receiving side receives the NVT ASCII data and delivers it to MIME to be transformed back to the original data.

9. What are the advantages of allowing persistent TCP connections in HTTP? (Nov/Dec 2016) (May/June 2013)

An application program (sometimes shortened to application) is any program designed to perform a specific function directly for the user or, in some cases, for another application program. Examples of application programs include word processors, database programs, Web browsers;

- Application programs use the services of the computer's operating system and other supporting programs.
- An application layer protocol defines how an application processes, running on different end systems, pass messages to each other.Eg :SMTP for electronic mail. HTTP for Web application.

10. Define SNMP. (May/June 2012)

Simple Network Management Protocol (SNMP) is an "Internet-standard protocol for managing devices on IP networks". Devices that typically support SNMP include routers, switches, servers, workstations, printers, & modem. It is used mostly in network management systems to monitor network-attached devices for conditions that warrant administrative attention.

11. Why name services are sometimes called as middleware?

Advanced middleware solutions offer centralized naming services with some level of distribution. The issues are the same as those associated with DNS on the Internet or NDS on NetWare. A new frontier in middleware support for naming is in supporting more dynamic configurations, where redundant services must be targeted with load balancing and fault tolerance.

12. What are the groups of HTTP header? (April/May 2015)

HTTP header fields provide required information about the request or response, or about the object sent in the message body. There are four types of HTTP message headers: General-header: These header fields have general applicability for both request and response messages.

13. Mention the different levels in domain name space. (Apr/May 2012) (May/June 2016)

Domain name space is divided into three different sections: generic domains, country domains & inverse domain.

Generic domain: Define registered hosts according to their generic behavior, uses generic suffixes.
Country domain: Uses two characters to identify a country as the last suffix.
Inverse domain: Finds the domain name given the IP address.

14. Name four factors needed for a secure network.

- **Privacy**: The sender and the receiver expect confidentiality.
- **Authentication**: The receiver is sure of the sender's identity & that an imposter has not sent the message.
- **Integrity**: The data must arrive at the receiver exactly as it was sent.
- **Non-Reputation**: The receiver must able to prove that received msg. came from a specific sender.

PART-B

1. **Describe the message format and the message transfer and the underlying protocol involved in the working of the electronic mail. (May/June 2016) (Nov/Dec 2015) (April/May 2015)**
   (Page No: 700-707, Text Book)

2. **(i) Explain in detail about SNMP messages. (Nov/Dec 2016) (April/May 2015)**
   (ii) Illustrate the features of TELNET. What is the need for network virtual terminal?
   (Page No: 752-755, Reference Book4), (Page No: 742-745, Reference Book4)

3. **(i)Explain HTTP with an example. (May/June 2016) (Nov/Dec 2015)**
   (ii) Discuss about MIME and IMAP.
   (Page No: 708-718, TextBook), (Page No: 700-707, Text Book)

4. **(i) Illustrate the features of FTP and its operation.**
   (ii) Explain the final delivery of email to the end user using POP3. (Nov/Dec 2016) (April/May 2015)
   (Page No: 745-746, ReferanceBook4), (Page No: 750-751, Reference Book4)

5. **Discuss the need for name resolution. Illustrate the domain name hierarchy and the steps in resolution.**
   (Page No: 745-755,Text Book)

6. **Explain in detail about web service architecture. (May/June 2016) (April/May 2015)**
   (Page No: 718-727,Text Book)

7. **Explain the SMTP and HTTP. Give their uses, state strengths and weaknesses.**
   (Page No: 700-718,Text Book)

8. **(i)Explain the various process involved after typing the URL in the task bar. (April/May 2017)**
   (ii)Write short notes on TELNET.
   (Page No: 785-789, Text Book), (Page No: 742-745, ReferenceBook4)

9. **(i) Illustrate the role POP3 in electronic mail Applications. (Nov/Dec 2016)**
   (ii) Explain the role of a DNS on a computer network. (Nov/Dec 2016) (Nov/Dec 2015)
   (Page No: 750-751, ReferenceBook4), (Page No: 745-755, Text Book)

10. **(i) Discuss FTP in detail.**
    (ii) Discuss SNMP Protocol in detail. (Nov/Dec 2016)
    (Page No: 745-746, ReferenceBook4), (Page No: 752-755, Reference Book4)

11. **Write short notes on: (i). PGP, (ii). SSH**
    (Page No: 665-670, Text Book)

ANNA UNIVERSITY PREVIOUS YEAR QUESTION PAPERS

Reg. No. :

Question Paper Code : 50395

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Fourth/Fifth/Sixth/Seventh/Eighth Semester

Computer Science and Engineering

CS6551 : COMPUTER NETWORKS

(Common to Biomedical Engineering, Electronics and Communication Engineering, Mechatronics Engineering, Information Technology)

(Regulations 2013)

Time : Three Hours — Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Define the terms : Bandwidth and Latency.
2. Compare Byte-oriented versus Bit-oriented protocol.
3. Show the Ethernet frame format.
4. Highlight the characteristics of datagram networks.
5. Differentiate between forwarding table and routing table.
6. What is Border Gateway Protocol (BGP) ?
7. Compare flow control versus congestion control.
8. What are the approaches used to provide a range of Quality of Service (QoS) ?
9. Write the use of Hyper Text Transfer Protocol (HTTP).
10. What do you mean by Web Services Description Language (WSDL) ?

PART – B (5×13=65 Marks)

11. a) With a neat sketch, explain the architecture of an OSI seven layer model. (13)

(OR)

b) Discuss the approaches used for error detection in networking. (13)

50395

12. a) Explain the functions of Wi-Fi and Bluetooth in detail. (13)

(OR)

b) i) Explain the datagram forwarding in IP. (7)

ii) Show and explain the ARP packet format for mapping IP addresses into Ethernet addresses. (6)

13. a) With an example, explain the function of link state routing protocol. (13)

(OR)

b) Elaborate on multicast routing protocols. (13)

14. a) i) Draw a TCP state transition diagram for connection management. (7)

ii) Brief about approaches used for TCP congestion control. (6)

(OR)

b) Write a detailed note on congestion avoidance mechanisms used in TCP. (13)

15. a) i) Explain the function of Internet Message Access Protocol (IMAP) with a state diagram. (8)

ii) List and explain the various HTTP request operations. (5)

(OR)

b) i) What is Domain Name System (DNS) ? Explain. (8)

ii) Brief about the importance of Simple Network Management Protocol (SNMP). (5)

PART – C (1×15=15 Marks)

16. a) Outline the steps involved in building a computer network. Give the detailed description for each step. (15)

(OR)

b) For the network given in Figure 1, give global distance – vector tables when

i) Each node knows only the distances to its immediate neighbors. (5)

ii) Each node has reported the information it had in the preceding step to its immediate neighbors. (5)

iii) Step (ii) happens a second time. (5)

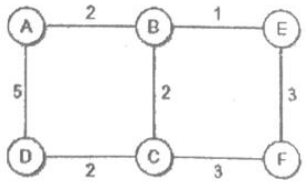


Figure 1

Reg. No. : | | | | | | | | | | | ? | ?

Question Paper Code : 71686

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Fourth/Fifth/Sixth/Seventh/Eighth Semester

Computer Science and Engineering

CS 6551 — COMPUTER NETWORKS

(Common to Biomedical Engineering, Electronics and Communication Engineering, Mechatronics Engineering, and Information Technology)

(Regulation 2013)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between packet switched and circuit switched networks.
2. What is meant by bit stuffing? Give an example.
3. State the functions of bridges.
4. When is ICMP redirect message used?
5. How do routers differentiate the incoming unicast, multicast and broadcast IP packets.
6. Why is IPV4 to IPV6 transition required?
7. List the advantages of connection oriented services over connectionless services.
8. How do fast retransmit mechanism of TCP works?
9. State the usage of conditional get in HTTP.
10. Present the information contained in a DNS resource record.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the challenges faced in building a network. (10)

(ii) Obtain the 4-bit CRC code for the data bit sequence 10011011100 using the polynomial $x^4 + x^2 + 1$. (3)

Or

(b) (i) With a protocol graph, explain the architecture of internet. (7)

(ii) Consider a bus LAN with a number of equally spaced stations with a data rate of 9 Mbps and a bus length of 1 km. What is the mean time to send a frame of 500 bits to another station, measured from the beginning of transmission to the end of reception? Assume a propagation speed of 150 m/s. If two stations begin to monitor and transmit at the same time, how long does it need to wait before an interference is noticed? (6)

12. (a) (i) Discuss the working of CSMA/CD protocol. (6)

(ii) Explain the functions of MAC layer present in IEEE 802.11 with necessary diagrams. (7)

Or

(b) (i) Consider sending a 3500-byte datagram that has arrived at a router R_1 that needs to be sent over a link that has an MTU size of 1000 bytes to R_2. Then it has to traverse a link with an MTU of 600 bytes. Let the identification number of the original datagram be 465. How many fragments are delivered at the destination ? Show the parameters associated with each of these fragments. (6)

(ii) Explain the working of DHCP protocol with its header format. (7)

13. (a) Explain in detail the operation of OSPF protocol by considering a suitable network. (13)

Or

(b) Explain the working of Protocol Independent Multi-cast (PIM) in detail. (13)

14. (a) (i) Explain the adaptive flow control and retransmission techniques used in TCP. (8)

(ii) With TCPs slow start and AIMD for congestion control, show how the window size will vary for a transmission where every 5th packet is lost. Assume an advertised window size of 50 MSS. (5)

Or

(b) (i) Explain congestion avoidance using random early detection in transport layer with an example. (7)

(ii) Explain the differentiate services operation of QOS in detail. (6)

15. (a) (i) Describe how SMTP transfers message from one host to another with suitable illustration. (6)

(ii) Explain IMAP with its state transition diagram. (7)

Or

(b) (i) List the elements of network management and explain the operation of SNMP protocol in detail. (8)

(ii) Discuss the functions performed by of DNS. Give example. (5)

PART C — (1 × 15 = 15 marks)

6. (a) (i) Draw the format of TCP packet leader and explain each of its field. (10)

(ii) Specify the justification for having variable field lengths for the fields in the TCP header. (5)

Or

(b) Illustrate the sequence of events and the respective protocols involved while accessing a web page from a machine when it is connected with internet for first time. (15)

SYLLABUS

EC6601 VLSI DESIGN L T P C

3 0 0 3

UNIT I MOS TRANSISTOR PRINCIPLE 9

NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams

UNIT II COMBINATIONAL LOGIC CIRCUITS 9

Examples of Combinational Logic Design, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles.

UNIT III SEQUENTIAL LOGIC CIRCUITS 9

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design

UNIT IV DESIGNING ARITHMETIC BUILDING BLOCKS 9

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT V IMPLEMENTATION STRATEGIES 9

Full custom and Semi-custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

TOTAL PERIODS: 45

TEXT BOOKS:

T1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated Circuits: A Design Perspective", Second Edition, Prentice Hall of India, 2003

T2. M.J. Smith, "Application Specific Integrated Circuits", Addisson Wesley, 1997

REFERENCES:

R1. N.Weste, K.Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addision Wesley 1993

R2. R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation",Prentice Hall of India 2005

R3. A.Pucknell, Kamran Eshraghian, "BASIC VLSI Design", Third Edition, Prentice Hall of India

R4. Jose Anand, "VLSI DESIGN", First Edition, Vijay Nicole Imprints Private Limited.

UNIT-I MOS TRANSISTOR PRINCIPLE

PART-A

1. **What is meant Channel length modulation in NMOS transistors? (A/M-2017)**

   The current between drain and source terminals is constant and independent of the applied voltage over the terminals. This is not entirely correct. The effective length of the conductive channel is actually modulated by the applied V. Increasing in V causes the depletion region at the drain junction to grow, reducing the length of the effective channel.

2. **Define propagation delay of a CMOS inverter. (A/M-2017)**

   The propagation delay of a CMOS inverter is the difference in time (calculated at 50% of input-output transition), when output switches, after application of input.

3. **Why NMOS transistor is selected as pull down transistor? (N/D-2017)**

   NMOS transistors produce "strong zeros," and PMOS devices generate "strong ones". An NMOS device pulls the output all the way down to GND, while a PMOS lowers the output no further than |VTp|. The PMOS turns off at that point, and stops contributing discharge current. NMOS transistors are hence the preferred devices in the PDN.

4. **What is the need of demarcation line? (N/D-2017)**

   In CMOS a demarcation line is drawn to avoid touching of p-diff with n-diff. All pMOS must lie on one side of the line and all nMOS will have to be on the other side.

5. **Define Threshold voltage for the MOSFET.**

   The Threshold voltage, V for a MOS transistor can be defined as the voltage applied V_T between the gate and the source of the MOS transistor below which the drain to source current, I_{DS} effectively drops to zero.

6. **What are the advantages of CMOS over NMOS?**

   a) Reduce complexity of the circuit, b) low static power consumption
   c) high noise immunity d) high density of logic function on a chip

7. **What are the objectives of layout rules?**

   The objective associated with layout rules is to obtain a circuit with optimum yield (functional circuits versus non-functional circuits) in as small as area possible without compromising reliability of the circuit.

8. **State channel-length modulation. Write down the equation for describing the channel length modulation effect in NMOS transistor. (A/M-2016)**

   The current between drain and source terminals is constant and independent of the applied voltage over the terminals. This is not entirely correct. The effective length of the conductive channel is actually modulated by the applied V. Increasing in V causes the depletion region at the drain junction to grow, reducing the length of the effective channel. The equation for describing the channel length modulation effect in NMOS transistor

$$I_D = I_D'(1 + \lambda V_{DS})$$

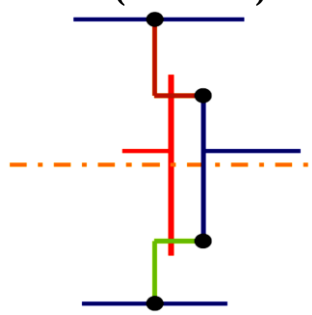
9. What is Latch-up? How to prevent latch up. (A/M-2016)

Latch up is a condition in which the parasitic components give rise to the establishment of low resistance conducting paths between V_{dd} and V_{ss} with disastrous results. Careful control during fabrication is necessary to avoid this problem.

10. Define body bias effect. (N/D-2016)

The threshold voltage V_T is not a constant with respect to the voltage difference between the body and the source of MOS transistor. This effect is called body-bias effect or body effect.

11. Draw the Stick diagram for CMOS inverter. (N/D-2016)



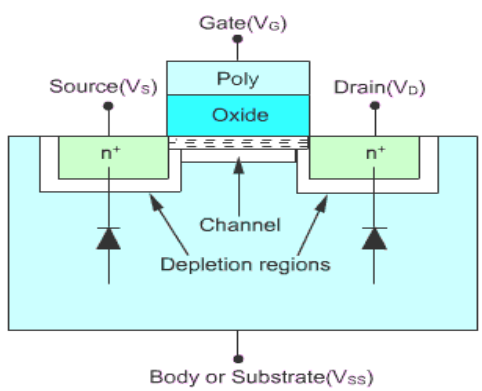
12. Define Scaling.

Scaling is defined as the simplified guidelines for shrinking device dimensions to increase transistor density & operating frequency and reduction in power dissipation & gate delays.

13. Give the various color coding used in stick diagram?

a)n-diffusion Green b)p-diffusion yellow c) polysilicon red d) metal-1 blue
e) metal-2 dark blue or purple f) contact cut black g) via black
h) demarcation line brown i) Vdd orVss contact black

14. Draw NMOS structure.



PART-B

1. **Draw the stick and layout diagram for NAND and NOR gate. (A/M-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:86-89]

2. **Explain the need of scaling, scaling principles and fundamental units of CMOS inverter. (A/M-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:71-75]

3. **Describe the equation for source to drain current in the three regions of operation of a MOS transistor and draw the VI characteristics.(M/J-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:31-37]

4. **Explain the DC transfer characteristics of a CMOS Inverter with necessary conditions for the different regions of operation. (M/J-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:55-59]

5. **Explain in detail about the body effect and its effect in MOS device. (M/J-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:49-50]

6. **Derive the noise margins for a CMOS inverter. (N/D-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:60-61]

7. **Draw and explain the DC and transfer characteristics of a CMOS inverter with necessary conditions for the different regions of operation. (A/M-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:31-37]

8. **Write the layout design rules and draw diagram for four input NAND and NOR gate. (N/D-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:88-89]

9. **Explain the different steps involved in n-well CMOS fabrication process with neat diagram. (N/D-2016)**
   Ref: "Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated Circuits [Page.no:76-78]

10. **Discuss in detail with a neat layout, the design rules for a CMOSinverter. (N/D-2016)**
    Ref: "VLSI DESIGN " by Jose Anand [Page.no:86-89]

11. **Discuss the scaling principles and its limits. (N/D-2016)**
    Ref: "VLSI DESIGN " by Jose Anand [Page.no:71-75]

12. **Discuss the mathematical equations that can be used to model the drain current and diffusion capacitance of MOS transistors. (N/D-2016)**
    Ref: "VLSI DESIGN " by Jose Anand [Page.no:37-40]

UNIT-II COMBINATIONAL LOGIC CIRCUITS

PART-A

1. Define Elmore constant. (A/M-2017)

Elmore constant is used in the approximation of the delay through an RC network in an electronic system. It is often used in applications such as logic synthesis, delay calculation, static timing analysis, placement and routing, since it is simple to compute and is reasonably accurate.

2. State the advantages of transmission gates. (A/M-2017)

The transmission gate passes over the entire voltage range. The transition resistance of the transmission gate varies depending upon the voltage to be switched, and corresponds to a superposition of the resistance curves of the two transistors.

3. Define Elmore delay and give expression for propagation delay of an inverter(A/M-2016)

Elmore delay is a simple approximation to the delay through an RC network in an electronic system. It is often used in applications such as logic synthesis, delay calculation, static timing analysis, placement and routing, since it is simple to compute (especially in tree structured networks, which are the vast majority of signal nets within ICs) and is reasonably accurate. Even where it is not accurate, it is usually faithful, in the sense that reducing the Elmore delay will almost always reduce the true delay, so it is still useful in optimization.

$$t_{Di} = \Sigma C_j \ \Sigma R_k$$

4. Why single phase dynamic logic structure cannot be cascaded? Justify. (A/M-2016)

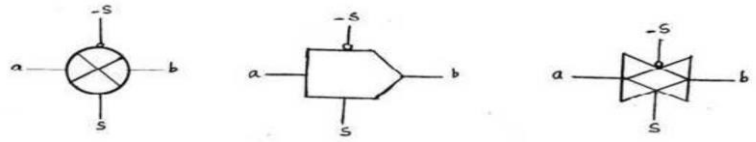
If several stages of the previous CMOS dynamic logic circuit are cascaded together using the same clock φ, a problem in evaluation involving a built-in “race condition” will exist

5. What is pass transistor logic?

Pass transistor logic (PTL) describes several logic families used in the design of integrated circuits. It reduces the count of transistors used to make different logic gates, by eliminating redundant transistors. Transistors are used as switches to pass logic levels between nodes of a circuit, instead of as switches connected directly to supply voltages. This reduces the number of active devices, but has the disadvantage that the difference of the voltage between high and low logic levels decreases at each stage.

6. What is Transmission gate and draw its symbols?

A transmission gate is similar to a relay that can conduct in both directions or block by a control signal with almost any voltage potential. It is a CMOS based switch in which PMOS passes a strong 1 but poor 0 and NMOS passes strong 0 but poor 1. Both PMOS and NMOS work simultaneously.



7. What is bubble pushing?

- Bubble pushing is a technique to apply De Morgan's theorem directly to the logic diagram.
- Change the logic gate (AND to OR and OR to AND).
- Add bubbles to the inputs and outputs where there were none, and remove the original bubbles.

- Logic gates can be De Morganized so that bubbles appear on inputs or outputs in order to satisfy signal conditions rather than specific logic functions. An active-low signal should be connected to a bubble on the input of a logic gate.
-

8. Define Elmore's constant. (N/D-2017)

Elmore constant is used in the approximation of the delay through an RC network in an electronic system. It is often used in applications such as logic synthesis, delay calculation, static timing analysis, placement and routing, since it is simple to compute and is reasonably accurate.

9. List the types of power dissipation. (N/D-2017)

(i) Static power dissipation
(ii) Dynamic power dissipation
(iii) Short circuit power dissipation

10. Define body bias effect. (N/D-2016)

The threshold voltage V_T is not a constant with respect to the voltage difference between the body and the source of MOS transistor. This effect is called body-bias effect or body effect.

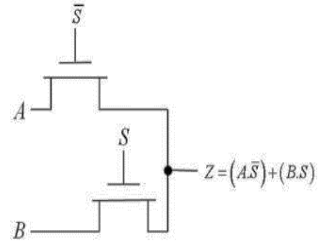
11. List out the sources of static and dynamic power consumption. (N/D-2016)

i) Static dissipation due to
-leakage current or other current drawn continuously from the power supply.
ii) Dynamic dissipation due to
- Switching transient current,
- Charging and discharging of load capacitances.

12. What are the sources of static power dissipation?

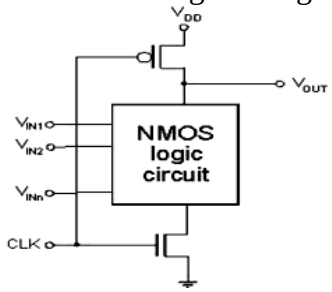
Leakage current or other current drawn continuously from the power supply are the sources of static power dissipation

13. Draw 2:1 Multiplexer using pass transistor logic.



14. What is domino logic and draw its structure?

Domino logic is a CMOS-based evolution of the dynamic logic techniques based on either PMOS or NMOS transistors. It allows a rail-to-rail logic swing. It was developed to speed up circuits.



PART-B

1. **Explain the dynamic power dissipation in CMOS circuits with necessary diagrams and expressions. (N/D-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:151]

2. **Discuss the low power design principles in detail. (N/D-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:152-153]

3. **Write short notes on**
   a) **Ratioed Circuits. (N/D-2016)**
   b) **Dynamic CMOS Circuits. (N/D-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:126-131,137-141]

4. **Explain about DCVSL logic with suitable example. (A/M-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:129-130]

5. **What is transmission gate? Explain the use of transmission gate. (A/M-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:107-108]

6. **Discuss in detail the characteristics of CMOS transmission gate? (M/J-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:107-108]

7. **What are the sources of power dissipation in CMOS and discuss various design techniques to reduce power dissipation in CMOS? (M/J-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:152-154]

8. **Explain the domino logic with neat diagram. (N/D-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:141-143]

9. **Draw the static CMOS logic circuit for the following expression(M/J-2016)**
   (a) $Y=\overline{(A \bullet B \bullet C.D)}$
   (b) $Y = \overline{D(A + BC)}$
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:109-112]

10. **Explain the static and dynamic power dissipation in CMOS circuits with necessary diagrams and expressions. (A/M-2017)**
    Ref: "VLSI DESIGN " by Jose Anand [Page.no:150-152]

11. **Derive the noise margins for a CMOS inverter. (N/D-2016)**
    Ref: "VLSI DESIGN " by Jose Anand [Page.no:60-61]

12. **Draw the CMOS logic circuit for the Boolean expression Z = [A(B + C) + DE] and explain. (N/D-2017)**
    Ref: "VLSI DESIGN " by Jose Anand [Page.no:109-112]

UNIT-III SEQUENTIAL LOGIC CIRCUITS

PART-A

1. **What is meant by pipelining? (A/M-2017)**

   Pipelining is a popular design technique often used to accelerate the operation of the data paths in digital processors. The major advantages of pipelining are to reduce glitching in complex logic networks and getting lower-energy due to operand isolation.

2. **Compare and contrast synchronous design and asynchronous design. (A/M-2017)**

   Synchronous circuits change state with every clock signal, with the state changing according to what the inputs are. Asynchronous circuits change states whenever the inputs change.

3. **What is NORA CMOS? (N/D-2017)**

   NORA means NO RAce

   During φ low (φ' high), each stage pre-charges
   - N logic stages pre-charge to Vdd; P logic stages pre-charge to GND

     When φ goes high (φ' low), each stage enters the evaluation phase
   - N logic evaluates to GND; P logic stages evaluate to Vdd
   - All NMOS and PMOS stages evaluate one after another in succession, as in Domino logic

4. **Define clock jitter. (N/D-2017)**

   Clock jitter is defined as the Temporal variations in consecutive edges of the clock signals; modulation + random noise-Cycle-to-cycle(short-term) long term

5. **Define Clock Skew.**

   Clock skew is defined as spatial variation in temporally equivalent clock edges.

6. **Define Set up and Hold time.**

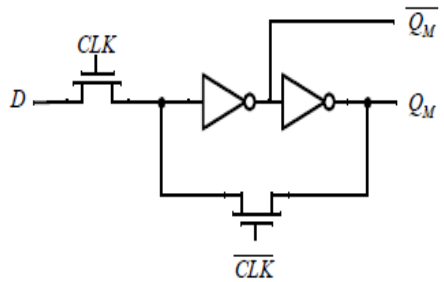
   Setup time: The amount of time before the clock edge that data input D must be stable the rising clock edge arrives.

   Hold time: This indicates the amount of time after the clock edge arrives that data input D must be held stable in order for the flip-flop to latch the correct value.

7. **What is bi stability?**

   Static memories use positive feedback to create a bistable circuit — a circuit having two stable states that represent 0 and 1.

8. **Draw the switch level schematic of multiplexer based nMOS latch using nMos only pass transistors for multiplexer. (A/M-2016)**



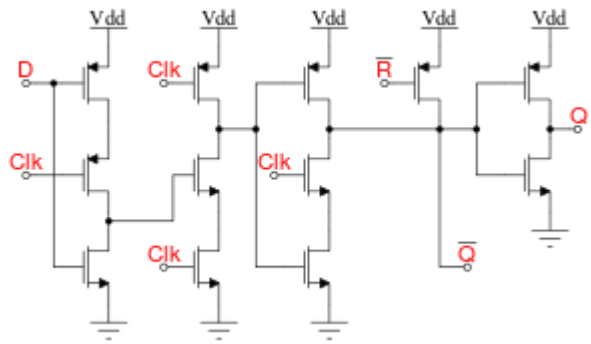
9. What is clocked CMOS register. (A/M-2016)

In integrated circuit design, dynamic logic (or sometimes clocked logic) is a design methodology in combinatory logic circuits, particularly those implemented in MOS technology. It is distinguished from the so-called static logic by exploiting temporary storage of information in stray and gate capacitances.

10. What is meant by pipelining? (N/D-2016)

Pipelining is a popular design technique often used to accelerate the operation of the data paths in digital processors. The major advantages of pipelining are to reduce glitching in complex logic networks and getting lower-energy due to operand isolation.

11. Draw the schematic of dynamic edge-triggered register. (N/D-2016)



12. Define Propagation delay and Contamination delay.

Propagation delay(tpd): The amount of time needed for a change in a logic input to result in a permanent change at an output, that is the combinational logic will not show any further output changes in response to an input change alter time fod units.

Contamination delay(tea): The amount of time needed for a change in a logic input to result in an initial change at an output, that is the combinational logic is guaranteed not to show any output change in response to an input change before fed time units have passed.

13. Compare Latches and Registers.

- Latch stores data when clock is low
- Register stores data when clock rises

14. What are positive and negative latches?

- Negative latch is transparent when CLK= 0
- Positive latch is transparent when CLK= 1

PART-B

1. **Discuss in detail various static latches and registers. (N/D-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:156-165]

2. **Explain the timing basics and clock distribution techniques in synchronous design in detail. (N/D-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:172-176]

3. **Discuss about the design of sequential dynamic circuits and its pipelining concept. (N/D-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:178-183]

4. **Explain different type of memory architecture and control unit in detail.**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:190-206]

5. **Explain the operation of True Single Phase Clocked Register. (A/M-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:168-169]

6. **Draw and explain the operation of Conventional, pulsed and resettable latches. (A/M-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:155-64]

7. **Write short notes on :**
   a) **True single-phase clocked register, (N/D-2016)**
   b) **NORA – CMOS latches. (N/D-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:168-169,180-183]

8. **Explain the operation of master-slave based edge triggered register. (M/J-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:159-163]

9. **Explain the concept of timing issues and pipelining. (A/M-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:169-182]

10. **Explain static and dynamic latches and registers in detail**
    Ref: "VLSI DESIGN " by Jose Anand [Page.no:155-168]

11. **State and explain bi stability principle.**
    Ref: "VLSI DESIGN " by Jose Anand [Page.no:156-157]

12. **Explain clocked CMOS registers in detail**
    Ref: "VLSI DESIGN " by Jose Anand [Page.no:166-168]

UNIT-IV DESIGNING ARITHMETIC BUILDING BLOCKS

PART-A

1. **List out the components of data path? (A/M-2017)**

A data path is a collection of functional units such as arithmetic logic units or multipliers, that perform data processing operations, registers, and buses. Along with the control unit it composes the central processing unit.

2. **Give the application of high speed adder. (A/M-2017)**

- The core of every microprocessor and digital signal processor is its data path. The heart of data-path and addressing units in turn are arithmetic units which include adders.
- Design of Arithmetic-Logic Units, floating-point arithmetic data paths, and in address generation units. Moreover, digital signal processing makes extensive use of high speed addition in the implementation of digital filters

3. **How to design a high speed adder? (N/D-2017)**

First, we should examine a realization of a one-bit adder which represents a basic building block for all the more elaborate addition schemes. Operations of a Full Adder is defined by the Boolean equations for the sum and carry signals shown in this slide: ai, bi, and ci are the inputs to the i-th full adder stage, and si and ci+1 are the sum and carry outputs from the i-th stage, respectively.

4. **What is latency? (N/D-2017)**

Latency is a time interval between the stimulation and response, or, from a more general point of view, a time delay between the cause and the effect of some physical change in the system being observed.

5. **What are the advantages of barrel shifter?**

- Signal has to pass through at most one transmission gate
- Propagation delay is constant and independent of the shift value
- Used for small shift values

6. **What is ALU and give its significance.**

An arithmetic logic unit (ALU) is a combinational digital electronic circuit that performs arithmetic and bitwise operations on integer binary numbers. An ALU is a fundamental building block of many types of computing circuits, including the central processing unit (CPU) of computers, FPUs, and graphics processing units (GPUs). A single CPU, FPU or GPU may contain multiple ALUs. The inputs to an ALU are the data to be operated on, called operands, and a code indicating the operation to be performed; the ALU's output is the result of the performed operation. In many designs, the ALU also has status inputs or outputs, or both, which convey information about a previous operation or the current operation, respectively, between the ALU and external status registers.

7. **Write any two design process of data path circuits**

A datapath is a collection of functional units such as arithmetic logic units or multipliers, that perform data processing operations, registers, and buses. Along with the control unit it composes the central processing unit

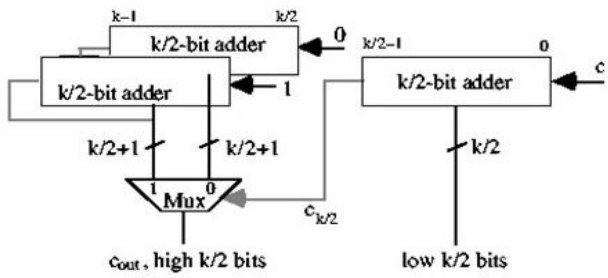
- A data path is best implemented in a **bit-sliced fashion**. A single layout is used repetitively for every bit in the data word. This regular approach eases the design effort and results in fast and dense layouts
- **Optimum sliced data path** circuits by rigorously optimizing transistor sizes and topologies

8. What is meant by bit-sliced data path organization. (A/M-2016)

Data path is the core of a processor. It is where all computations are performed. They are generally arranged in a bit sliced organization. Instead of operating on single bit digital signals , the data in a processor is arranged ina word based fashion. A 32 bit processor operates on data words that are 32 bit wide. Since the same operation has to be performed on each bit of the data word , the data path cosists of 32 identical slices, each of them operating on a single bit. So the name bit sliced. Data path designer can concentrate on the design of a single slice that is repeated 32 times.

9. Determine propagation delay of n-bit carry select adder. (A/M-2016)

Carry-Select Adders



Carry-select adder for k-bit numbers built from three k/2-bit adders.

$$C_{select\text{-}add}(k) = 3C_{add}(k/2) + k/2 + 1$$
$$T_{select\text{-}add}(k) = T_{add}(k/2) + 1$$

10. Why barrel shifter very useful in the designing of arithmetic circuits? (N/D-2016)

A barrel shifter is a digital circuit that can shift a data word by a specified number of bits without the use of any sequential logic, only pure combinatorial logic. One way to implement it is as a sequence of multiplexers where the output of one multiplexer is connected to the input of the next multiplexer in a way that depends on the shift distance. A barrel shifter is often used to shift and rotate n-bits in modern microprocessors, typically within a single clock cycle. Thus, barrel shifter very useful in the designing of arithmetic circuits

11. Write the principle of any one fast multiplier? (N/D-2016)

- Partial product generation
- Partial product accumulation

12. List out the types of high speed adder.

- Ripple carry adder
- Carry look ahead adder
- Carry save adder

13. Give some applications of multipliers in digital circuits.

- Datapath in microprocessor
- MAC (multiply and accumulate) structures
- ALU (Arithmetic and logical unit)
- High speed integrated circuits
- Filter design, convolution in Digital signal processing applications

14. Comment on performance of Ripple Carry Adder.

It is linearly proportional to the no of bits. It reduces the delay of the carry path. It reduces the capacitance of carry bit

PART-B

1. **Explain the operation of a basic 4 bit adder. Describe the different approaches of improving the speed of the adder. (N/D-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:216-218]

2. **Design a 16 bit carry bypass and carry select adder and discuss their features. (M/J-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Internet/PPT]

3. **Draw the structure of ripple carry adder and explain its operation. How the drawback in ripple carry adder overcome by carry look ahead adder and discuss. (N/D-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:216-218]

4. **Design a multiplier for 5 bit by 3 bit Explain its operation and summarize the number of adders Discuss it over Wallace multiplier. (N/D-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:229-231]

5. **Explain the concept of modified Booth multiplier with a suitable example. (A/M-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:224-226]

6. **Explain barrel shifter and its operation in detail.**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:236-238]

7. **Explain the operation of booth multiplication with suitable examples? Justify how booths algorithm speed up the multiplication process. (N/D-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:224-226]

8. **Design a 4 x 4 array multiplier and write down the equation for delay. (M/J-2016)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:227-228]

9. **Explain the concept of carry look ahead adder with neat diagram. (A/M-2017)**
   Ref: "VLSI DESIGN " by Jose Anand [Page.no:218-221]

10. **Discuss the details about speed and area trade off. (A/M-2017)**
    Ref: "VLSI DESIGN " by Jose Anand [Page.no:239-251]

11. **Explain ALU and give its importance in processor.**
    Ref: "VLSI DESIGN " by Jose Anand [Page.no:238-239]

12. **Explain the architectures of ripple carry adder.**
    Ref: "VLSI DESIGN " by Jose Anand [Page.no:216-218]

UNIT-V IMPLEMENTATION STRATEGIES

PART-A

1. **What is meant by CBIC? (A/M-2017)**

A cell-based ASIC uses predesigned logic cells (e.g. AND gates, OR gates, multiplexers, and flip-plops,) known as standard cells, also pronounced as "Sea Bick" or CBIC. The CBIC are built of rows of standard cells like a wall built of bricks. The standard cell areas may be used in combination with microcontrollers or even microprocessors.

2. **Name the elements in a Configuration Logic Block. (A/M-2017)**
   - Combinational logic
   - Flip flops

3. **What is ULSI? (N/D-2017)**

ULSI ie., Ultra large-scale integration (ULSI) is the process of integrating or embedding millions of transistors on a single silicon semiconductor microchip and also refers loosely to placing more than about one million circuit elements on a single chip. The Intel 486 and Pentium microprocessors, for example, use ULSI technology.

4. **Write the various ways of routing procedure. (N/D-2017)**
   - Global routing
     - Line routing
     - Maze routing
   - Detailed routing
     - Channel routing
     - Switch box routing

5. **What is a primitive cell?**

Primitive cell is a unit cell that contains exactly one lattice point. It is the smallest possible cell. If there is a lattice point at the edge of a cell and thus shared with another cell, it is only counted half. Accordingly, a point located on the corner of a cube is shared by 8 cubes and would count with 1/8.

6. **List the advantages of CBIC.**
   - Less cost
   - Less time
   - Reduced risk
   - Standard cell is optimized individually
   - Transistor operate at maximum speed

7. **State the feature of full custom design.**

In a full custom ASIC, an engineer designs some or all of the logic cells, circuits or layout specifically for one ASIC. It makes sense to take this approach only if there are no suitable existing cell libraries available that can be used for the entire design.

8. **What arc feed through cells? State their uses. (A/M-2016)**

Feed though is a piece of metal used to pass a signal through cell or to a space. Feed through cells needed for vertical routing for routing using the same metal layer(s) as within cells

9. **State the features of full custom design. (A/M-2016)**

In a full custom ASIC, an engineer designs some or all of the logic cells, circuits or layout specifically for one ASIC. It makes sense to take this approach only if there are no suitable existing cell libraries available that can be used for the entire design.

10. **What is the standard cell based ASIC design? (N/D-2016)**

A cell-based ASIC uses predesigned logic cells (e.g. AND gates, OR gates, multiplexers, and flip-plops,) known as standard cells, also pronounced as “Sea Bick” or CBIC. The CBIC are built of rows of standard cells like a wall built of bricks. The standard cell areas may be used in combination with microcontrollers or even microprocessors.

11. **What is an antifuse? State its merits and demerits. (N/D-2016)**

An antifuse is normally high resistance (>100M). On application of appropriate programming voltages, the antifuse is changed permanently to a low-resistance structure (200-500).

12. **What is an Interconnect?**

Interconnect is a element which interconnects the different elements in the IC. Interconnect involves in routing procedure particularly in loose routing and detailed routing in the design process of FPGA

13. **Define flexible blocks.**

The predesigned logic cells are known as standard cells. The standard cell areas are called flexible blocks. These flexible blocks can be adjusted and optimized based on the design procedure of FPGA.

14. **What is FPGA? Give its importance**

A field-programmable gate array (FPGA) is an integrated circuit designed to be configured by a customer or a designer after manufacturing – hence "field-programmable". The FPGA configuration is generally specified using a hardware description language (HDL), similar to that used for an application-specific integrated circuit (ASIC).

PART-B

1. **With neat sketch explain the CLB,IOB and programmable interconnects of an FPGA device. (M/J-2016)**

Ref: “VLSI DESIGN ” by Jose Anand [Page.no:262]

2. **Write short notes on: (a) Full custom ASIC (M/J-2016) (b) Semi-custom ASIC (M/J-2016)**

Ref: “VLSI DESIGN ” by Jose Anand [Page.no:254-260]]

3. **Draw and explain the building blocks of FPGA. (N/D-2017)**

Ref: “VLSI DESIGN ” by Jose Anand [Page.no:266]

4. **Write short note on routing procedures involved in FPGA interconnect. (A/M-2017)**

Ref: “VLSI DESIGN ” by Jose Anand [Page.no:216-218]

5. **Explain different types of XILINX (3000,4000) architecture in details (A/M-2017)**

Ref: “VLSI DESIGN ” by Jose Anand [Page.no:270-272]

6. **Explain standard cell design and cell library.**
   Ref: “VLSI DESIGN ” by Jose Anand [Page.no:262-263]

7. **Briefly explain the semi-custom ASIC with its classification. (N/D-2016)**
   Ref: “VLSI DESIGN ” by Jose Anand [Page.no:256-260]

8. **Explain the various types of ASIC with neat diagram. (N/D-2017)**
   Ref: “VLSI DESIGN ” by Jose Anand [Page.no:253-260]

9. **Explain ALTERAFLEX and ALTERAMAX architecture**
   Ref: “VLSI DESIGN ” by Jose Anand [Page.no:274-278]

10. **Explain about building block architecture of FPGA. (A/M-2017)**
    Ref: “VLSI DESIGN ” by Jose Anand [Page.no:261]

11. **Explain different types of XILINX(4000,5200) architecture in details**
    Ref: “VLSI DESIGN ” by Jose Anand [Page.no:270-272]

12. **Explain routing procedures involved in FP GA interconnect.**
    Ref: “VLSI DESIGN ” by Jose Anand [Page.no:277-283]

ANNA UNIVERSITY PREVIOUS YEAR QUESTION PAPERS

B.E. /B.Tech. Degree Examination, November/December 2017
Sixth Semester
Electronics and Communication Engineering
EC 6601 – VLSI DESIGN
(Regulations-2013)

Time: 3 Hours Maximum marks: 100 marks

Answer All Questions

Part-A (10x2=20 Marks)

1. Why NMOS transistor is selected as pull down transistor?
2. What is the need of demarcation line?
3. Define Elmore's constant.
4. List the types of power dissipation.
5. What is NORA CMOS?
6. Define clock jitter.
7. How to design a high speed adder?
8. What is latency?
9. What is ULSI?
10. Write the various ways of routing procedure

Part-B (5x16=80)

11. a) (i)Explain the electrical properties of CMOS. (8)
    (ii) Discuss the scaling principles and its limits. (8)

(or)

b) Write the layout design rules and draw diagram for four input NAND and NOR gate. (16)

12. a)(i)Draw the CMOS logic circuit for the Boolean expression
    Z = [A(B + C) + DE] and Explain. (8)
    (ii)Explain the basic principle of transmission gate in CMOS design. (8)

(or)

b) (i)Explain the domino logic with neat diagram. (8)
(ii) Discuss the low power design principles in detail. (8)

13. a) Discuss about the design of sequential dynamic circuits and its pipelining concept. (16)

(or)

b) Explain the timing basics and clock distribution techniques in synchronous design in detail. (16)

14. a) Draw the structure of ripple carry adder and explain its operation. How the drawback in ripple carry adder overcome by carry look ahead adder and discuss. (16)

(or)

b) Design a multiplier for 5 bit by 3 bit Explain its operation and summarize the number of adders Discuss it over Wallace multiplier. (16)

15. (a)Explain the various types of ASIC with neat diagram. (16)

(or)

b) Draw and explain the building blocks of FPGA. (16)

B.E. /B.Tech. Degree Examination, April/May 2017
Sixth Semester
Electronics and Communication Engineering
EC 6601 – VLSI DESIGN
(Regulations-2013)

Time: 3 Hours Maximum marks: 100 marks

Answer All Questions

Part-A (10x2=20 Marks)

1. What is meant Channel length modulation in NMOS transistors?
2. Define propagation delay of a CMOS inverter?
3. Define Elmore constant.
4. State the advantages of transmission gates.
5. What is meant by pipelining?
6. Compare and contrast synchronous design and asynchronous design.
7. List out the components of data path?
8. Give the application of high speed adder.
9. What is meant by CBIC?
10. Name the elements in a Configuration Logic Block.

Part-B (5x16=80)

11. a)(i)Draw and explain the DC and transfer characteristics of a CMOS inverter with necessary conditions for the different regions of operation. (8)

(ii)Draw the layout diagram for NAND and NOR gate. (8)

(or)

b) Explain the need of scaling, scaling principles and fundamental units of CMOS inverter. (16)

12. a) (i)Explain about DCVSL logic with suitable example. (10)

(ii)What is transmission gate? Explain the use of transmission gate. (6)

(or)

b) Explain the static and dynamic power dissipation in CMOS circuits with necessary diagrams and expressions. (16)

13. a)(i)Explain the operation of True Single Phase Clocked Register. (8)

(ii)Draw and explain the operation of Conventional, pulsed and resettable latches. (8)

(or)

b) Explain the concept of timing issues and pipelining. (16)

14. a)(i)Explain the concept of carry look ahead adder with neat diagram.(10)

(ii)Discuss the details about speed and area trade off. (6)

(or)

b)Explain the concept of modified Booth multiplier with a suitable example. (16)

15. (a)Explain about different types of ASIC with neat diagram. (16)

(or)

b)(i) Explain about building block architecture of FPGA. (10)

(ii)Write short note on routing procedures involved in FPGA interconnect.(6)

SYLLABUS

EC6602 ANTENNA AND WAVE PROPAGATION L T P C

3 0 0 3

UNIT I FUNDAMENTALS OF RADIATION 9

Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Bandwidth, Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, Half wave dipole. Folded dipole, Yagi Array

UNIT II APERTURE AND SLOT ANTENNAS 9

Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna, Reflector antenna, Aperture blockage, Feeding structures, Slot antennas, Microstrip antennas – Radiation mechanism – Application, Numerical tool for antenna analysis

UNIT III ANTENNA ARRAYS 9

N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array

UNIT IV SPECIAL ANTENNAS 9

Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR

UNIT V PROPAGATION OF RADIO WAVES 9

Modes of propagation, Structure of atmosphere, Ground wave propagation, Tropospheric propagation, Duct propagation, Troposcatter propagation, Flat earth and Curved earth concept Sky wave propagation – Virtual height, critical frequency, Maximum usable frequency – Skip distance, Fading, Multi hop propagation.

TOTAL PERIODS: 45

TEXT BOOKS:

T1. John D Kraus," Antennas for all Applications", 3rd Edition, McGrawHill, 2005

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R1. Edward C.Jordan and Keith G.Balmain" Electromagnetic Waves and Radiating Systems" PrenticeHall of India, 2006.

R2. R.E. Collin,"Antennas and Radiowave Propagation", McGrawHill 1985.

R3. Constantine.A. Balanis "Antenna Theory Analysis and Design", Wiley Student Edition, 2006.

R4. Rajeswari Chatterjee, "Antenna Theory and Practice" Revised Second Edition New Age International Publishers, 2006.

R5. S. Drabowitch, "Modern Antennas" Second Edition, Springer Publications, 2007.

R6. Robert S.Elliott "Antenna Theory and Design" Wiley Student Edition, 2006.

R7. H.Sizun "Radio Wave Propagation for Telecommunication Applications", First Indian Reprint, Springer Publications, 2007.

UNIT-I FUNDAMENTALS OF RADIATION

PART-A

1. **What is the effective area of a half wave dipole operating at 1 GHz? (May 2013)**

$Given\ data: f = 1GHz,$

$$\lambda = \frac{c}{f} = \frac{3x10^8\ m/s}{1x10^9 Hz} = 0.3m,$$

A Half wave dipole has a directivity of *D=1.64*

$$A_e = \frac{\lambda^2 D}{4\pi} = \frac{(0.3)^2 x1.64}{4\pi} = \mathbf{11.74\ m^2}$$

2. **What is an elementary dipole? and how does it differ from the infinitesimal dipole? (May 2013)**

A short dipole that does have a uniform current will be known as elemental dipole. Such a dipole will generally be considerably shorter than the one tenth wavelength maximum specified for a shorter dipole. The other terms used for elemental dipole are elementary dipole, elementary doublet and Hertzian dipole. When the length of the short dipole is vanishingly small, the term infinitesimal dipole used.

3. **Define radiation resistance. (AUC, May 2016)**

The antenna is a radiating device in which power is radiated into space in the form of electromagnetic waves. Hence there must be power dissipation,

which may have expressed as, $W' = I^2 R$.

If it is assumed that all this power appears as electromagnetic waves, at that point where it is fed to the antenna and obtain a fictitious resistance called as radiation resistance.

i.e. $R_r = W'/I^2$

4. **What is meant by retarded potential? (AUC, Nov 2016)**

If the potential is delayed (or) retarded by a given amount of time, then it is called retarded potential.

$$\frac{\mu}{4\pi}\int \frac{I_m sin\omega(t-\frac{r}{c})}{r}$$

Time delay = $(t - \frac{r}{c})$ is introduced.

5. **The voltage induced by the application of an electric field of strength 2 Volt / meter is 0.7. Calculate the effective length of the element. (AUC, Nov 2016)**

Effective length $l_e = \frac{V}{E} = \frac{0.7}{2}$ = 0.35 meter

6. **Differentiate Radian and Steradian. (AUC, Nov 2017)**

Radian	Steradian
To measure a plane angle radian is used	To measure of a solid angle steradian is used
Defined as the plane angle with its vertex at center of a circle of radius r, i.e., subtended by an arc whose length is r. As the circumference of a circle radius r is c=2πr, there are 2π radian.	Defined as the solid angle with its vertex at the center of a sphere of radius r, i.e., subtended by a spherical surface area equal to that of a square with each side of length r. As the area of the sphere of radius r is $A=4\pi r^2$, there are 4π steradian

7. An antenna field pattern given by $E(\theta)= \cos^2(\theta)$ for $0^o \leq \theta \leq 90^o$. Find HPBW. (AUC, Apr 2017)

Solution:

$E(\theta) = 0.707$ (at half power)

Therefore $E(\theta) = \cos^2(\theta) = 0.707$;

$\theta = \cos^{-1}[(0.707)^{1/2}] = 33^o$

$2\theta = 2x33^o =$ **66°**

8. Define gain of an antenna. Mention the relationship between gain and aperture of an antenna. (AUC, Apr 2017).

Gain of an antenna is defined as, "The ratio of maximum radiation intensity in given direction to the maximum radiation intensity from a reference antenna produced in the same direction with same input power"

Relationship between gain and aperture of an antenna as follows,

Gain of an antenna is, $G_o = kD$; Where, k = Efficiency factor, D=Directivity

Directivity(D) in terms of Maximum effective aperture(A_{em}) is given by,

$D = (4\pi/\lambda^2)A_{em}$

Therefore, $G_o = k\,(4\pi/\lambda^2)A_{em}$

9. What is meant by directive gain?

The directive gain (G_D) in a given direction is defined as, "The ration of the radiation intensity in that direction to the average radiated power"

Directive Gain (G_D) = Radiation intensity in a particular direction / Average radiated power.

10. Define an isotropic radiator. (AUC, Nov 2014)

"An isotropic radiator is a radiator which radiates uniformly in all the directions". It is also called as isotropic source or omni directional radiator or simply unipole.

An isotropic radiator is a hypothetical lossless radiator or antenna, with which the practical radiators or antennas are compared. Thus, an isotropic antenna or radiator is used as reference antenna.

11. Write brief notes on Power Gain and Directive Gain.

Power gain compares the radiated power density of the actual antenna and that of an isotropic antenna based on the same input power to both.

i.e., G_P = Power density radiated in a particular direction by the subject antenna / Power density radiated in that direction by an isotropic antenna.

Directive Gain defined as, "as the ratio of the power density in that particular at a given distance, to the power density that would be radiated at the same distance by an isotropic antenna, radiating the same total power".

i.e., G_d = Power density radiated in a particular direction by subject antenna / power density radiated in that particular direction by an isotropic antenna.

12. Compare Short dipole from Half wave dipole. (AUC, May 2014).

Short dipole	Half wave dipole
Radiation resistance $R_a = 80\pi^2(dl/\lambda)^2$; *For short dipole* $dl = \lambda/10$, Therefore, $R_a \approx 7.9\Omega$	$R_a \approx 73\Omega$
Directivity, $D_{max} = 1.5$	$D_{max} = 1.64$

Half wave dipole can be considered as an array of short dipoles.

13. **Write the importance of radiation resistance of an antenna. (AUC, May 2015, Nov 2015)**

From the circuit point of view, the antennas appear to the transmission lines as a resistance R_r, called the radiation resistance.

It is not related to any resistance in the antenna itself but is a resistance coupled from space to the antenna terminals.

The radiation resistance R_r may be thought of as a "virtual" resistance that does not exist physically but is a quantity coupling the antenna to distant regions of space via a "virtual" transmission line.

14. **Define radiation pattern.**

Radiation pattern is the relative distribution of radiated power as a function of distance in space. It is a graph which shows a variation in actual field strength of EM wave at all points which are at equal distance from the antenna

PART B

1. **Derive the expression for the radiated fields of a center fed λ/2 dipole antenna. Sketch the radiation pattern. (AUC, May 2013, May 2014, May 2015, May 2016, Nov 2016)**
[Text Book: John D Kraus," Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 80-82]

2. **Explain the principle of reciprocity as applied to an antenna? (AUC, Apr 2013)**
[Text Book: John D Kraus," Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg.655-656]

3. **Derive the radiation resistance of an oscillating electric dipole. (AUC, Nov 2013)**
[Text Book: John D Kraus," Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 164-166]

4. **Derive the expression for the field quantities (E and H) for a small oscillation current element. (AUC, May 2016)**
[Text Book: John D Kraus," Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 157-160]

5. **Explain the following terms with respect to antenna.**
(i) Effective aperture, (ii) Directivity, (iii) Polarization. (AUC, May 2015, Nov 2015)
[Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006, pg. 89 & 92], [Text Book: John D Kraus," Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg.18], [Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006, pg. 70]

6. **Explain and prove that the radiation resistance of λ/2 dipole antenna has 73Ω. (AUC, Apr 2016)**
[Text Book: John D Kraus," Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg.171-172]

7. **Explain the terms, (i) Beam solid angle (ΩA), (ii) Antenna temperature (iii) Normalized field pattern (AUC, Apr 2014)**
[Text Book: John D Kraus," Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg.15], [Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006,

pg. 104-107], [Text Book: John D Kraus," Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg.11-13]

8. **Define the following parameters and their dependence on antenna performance (i) Radiation Pattern (ii) Input impedance (iii) Polarization. (AUC, May 2014**
   [Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006, pg. 27-29, 80-82, 70-71]

9. **Derive the expression for the field quantities radiated from a λ/2 dipole and derive its radiation resistance. (AUC, Apr 2016)**
   [Text Book: John D Kraus," Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg.80-82, 171-172]

10. **Draw a neat sketch of a 3 element Yagi-Uda antenna and explain its principle of operation. (AUC, Nov 2017).**
    [Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006, pg. 577-581]

11. **Explain the principle of radiation from oscillating electric dipole. Derive the near field and far field expressions. (AUC, Nov 2016)**
    [Text Book: John D Kraus," Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 157-160]

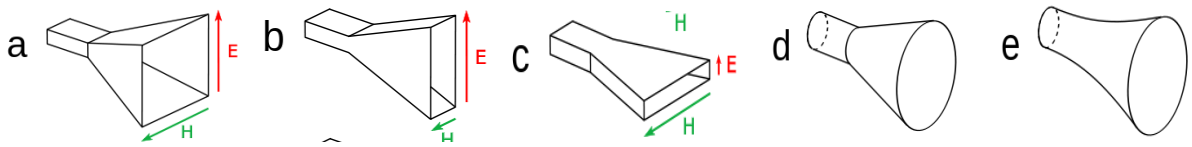
12. **Derive the total power radiated by half wave dipole.**
    [Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006, pg. 182-184]

13. **Explain effective aperture area with its types in detail.**
    [Ref Book: K.D. Prasad, "Antenna and Wave Propagation", pg. 548-553]

UNIT–II APERTURE AND SLOT ANTENNAS

PART-A

1. Draw the different types of horn antenna. (AUC, Nov 2016)



(a). Pyramidal horn, (b) E-Plane Sectorial Horn, (c). H-Plane Sectorial horn, (d). Conical horn, (e) Exponential horn.

2. Compare flat reflector and corner reflector. (AUC, May 2013)

Reflectors are widely used to modify the radiation pattern of a radiating element.

A flat reflector near a linear dipole antenna to reduce backward radiation, also yields a substantial gain in the forward radiation.

With two flat sheets intersecting at an angle $\alpha(<180^o)$, a sharper radiation pattern than from a flat sheet reflector ($\alpha=180^o$) can be obtained. If the corner angle is 90°, then the property that an incident wave is reflected back toward its source.

3. What are the applications of microstrip antenna? (AUC, May 2015)

- Used in Mobile Satellite communication system.
- Direct broad cast television (DBS)
- Wireless LAN's
- Feed elements in coaxial system.
- GPS System,
- Missiles and telemetry,
- UHF patch antennas for space

4. State Babinet's principle. (AUC, Nov 2017)

Babinet's principle states that when the field behind a screen with an opening is added to the field of a complementary structure, the sum is equal to the field when there is not screen

5. Mention any four advantages of microstrip antenna. (AUC, Apr 2017)

- Ease of manufacturing
- It has a very low fabrication cost.
- Microstrip patch antennas are efficient radiators.
- It has a support for both linear and circular polarization.
- Easy in integration with microwave integration circuits.

6. What is slot antenna? Mention its applications. (AUC, May 2016)

A slot antenna consists of a metal surface, usually a flat plate, with one or more holes or slots cut out. When the plate is driven as an antenna by a driving frequency, the slot radiates electromagnetic waves in a way similar to a dipole antenna

Applications:

- radar navigational purposes
- Used as an array fed by a wave guide

7. Brief the term aperture blockage of antenna.

Aperture blockage also known as feed blockage: part of the feed energy is reflected back into the feed antenna and does not contribute to the main beam.

8. The radiation resistance of an antenna is 72Ω and the loss resistance is 8Ω. What is the directivity (in dB), if the power gain is 15? (AUC, Apr 2016)

Solution:

Antenna Efficiency, $\eta = \frac{R_r}{R_r+R_l} = \frac{72}{72+8} = 0.9$

The relation between power gain and directivity is given by,

$G_P = \eta D$

$D = G_P / \eta = 16/0.9 = 17.78$

Hence the directivity in dB is given by,

$D(dB) = 10 log_{10}(17,78) =$ **12.5dB**

9. What are the various feeds used in reflector?

- Dipole antenna feed
- Horn feed
- End fire feed
- Casse grain feed.

10. List the merits and applications of offset feed reflector antenna. (AUC, Nov 2013)

High gain: Parabolic reflector antennas are able to provide very high levels of gain. The larger the 'dish' in terms of wavelengths, the higher the gain

High directivity: As with the gain, so too the parabolic reflector or dish antenna is able to provide high levels of directivity. The higher the gain, the narrower the beam width.

Applications: K_U band home satellite television dish, Direct broadcast satellites, radar antennas.

11. Name some numerical tools that can be used to analyze an antenna. (AUC, Nov 2016)

Some of the numerical tools that can be used to analyze an antenna are:

(i) Computer Aided Design (CAD) software is one of the most important numerical tool in the fields of microwave and antenna engineering

(ii) Numerical Electromagnetic Code (NEC) – based on the method of moments developed at Lawrence Livermore National Laboratory.

(iii) High Frequency Structure Simulator (HFSS) – based on the finite element method developed by Ansoft.

(iv) IE3D from Zeland software.

12. What is the difference between slot antenna and its complementary dipole antenna?

a) Polarization are different ie., the electric fields associated with the slot antenna are identical with the magnetic field of the complementary dipole antenna.

b) The electric field be vertically polarized for the slot and horizontally polarized for the dipole.

c) Radiation from the back side of the conducting plane of the slot antenna has the opposite polarity from that of the complementary antenna

13. What is f/D ratio?

The ratio of the focal length f to the diameter D of the reflector is called the f /D ratio or focal ratio.

14. Define E – Plane and H – Plane Horn antenna.

E- plane is defined as the plane passing through the antenna in the direction of beam maximum and parallel to the far field E – vector. **E-plane horn antenna:** A sectoral horn flared in the direction of the electric or E-field in the waveguide. **H – plane** defined as the plane passing through the antenna in the direction of beam maximum and parallel to the far field H – vector. **H-plane horn antenna**: A sectoral horn flared in the direction of the magnetic or H-field in the waveguide

PART B

1. **With neat diagram, Explain the principle of parabolic reflector antenna and various types of feed used. (AUC, May 2013, May 2014, May 2015, May 2016)**
   [Text Book: John D Kraus,"Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 385-389]
2. **Illustrate the aperture blockage and explain how it can be overcome by the offset feed. What are the advantages of cassegrain feed?**
   [Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006, pg. 1006-1009]
3. **Explain in detail the radiation from a slot antenna and their feed systems. (AUC, Nov 2016)**
   [Text Book: John D Kraus,"Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 267-273]
4. **Write short notes on: (i) Horn antenna, (ii) Microstrip antenna. (AUC, Nov 2017)**
   [Text Book: John D Kraus,"Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 283-286, 500-506]
5. **Explain the radiation mechanism of Cassegrain reflector antenna with necessary diagrams.**
   [Text Book: John D Kraus,"Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 613-614]
6. **Identify the importance of Babinet's principle on complementary antennas.**
   [Text Book: John D Kraus,"Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 273-275]
7. **Discuss the geometry of a parabolic reflector and the significance of f/D ratio. Explain its feed configurations. (AUC, Apr 2016)**
   [Text Book: John D Kraus,"Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 383-387, 394]
8. **Describe the radiation patterns and fields on the axis of an E-Plane and H-Plane sectorial horns. (AUC, Nov 2014)**
   [Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006, pg. 739-749, 755-763]
9. **Explain the construction and principle of pyramidal horn antenna. A pyramidal horn antenna having aperture dimensions of a=12cm and b=6cm is used at a frequency of 10GHz. Calculate its directivity and half power beam widths. (AUC, Apr 2013)**

   Solution

   Frequency = 10 GHz;

$$\lambda = \frac{3\times10^8}{10\times10^9} = 3cm$$

$$d = 12cm \quad and \quad w = 6cm$$

$$Beam\ width: \phi_E = 56\frac{\lambda}{d} = 14^0$$

$$\phi_H = 67\frac{\lambda}{w} = 33.5^0$$

$$power\ gain = \frac{4.5wd}{\lambda^2} = 36 = 15.56dB \quad Directivity = \frac{7.5wd}{\lambda^2} = 60$$

10. **Explain the salient features of Flat and corner reflector antenna. (AUC, Apr 2014)**
    [Text Book: John D Kraus,"Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 368-378]
11. **Describe the working of slot antenna. What is the terminal impedance of slot antenna? (AUC, May 2012).**
    [Text Book: John D Kraus,"Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 278-280]
12. **Explain the radiation characteristics of microstrip antenna with different types of feeding structures and mention its application. (AUC, Dec 2011, Apr 2017)**
    [Text Book: John D Kraus," Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 503-509]
13. **Explain the principle of rectangular horn antenna with a neat sketch.**
    [Text Book: John D Kraus," Antennas and Wave Propagation", 4th Ed., McGrawHill, 2012, pg. 283-285]

UNIT–III ANTENNA ARRAYS

PART-A

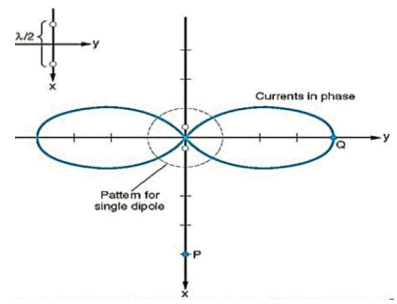
1. Define pattern multiplication and draw the pattern of 2-point sources separated by λ/2. (Nov 2015)

The total field pattern of an array of non-isotropic but similar sources is the multiplication of the

i) Individual source pattern and

ii) Pattern of an array of isotropic point sources each located at the phase center of the individual source having the relative amplitude and phase.

Whereas the total phase pattern is the sum of the phase patterns of the individual sources and that of the array of isotropic point sources.



2. Write the advantages of antenna arrays? (AUC, May 2014)

- They can provide the capability of a steerable beam (radiation direction change) as in smart antennas.
- They can provide a high gain (array gain) by using simple antenna elements.
- They provide a diversity gain in multipath signal reception.
- They enable array signal processing

3. Give the needs of Binomial array. (AUC, May 2013, Nov 2014)

The need for a binomial array is,

- In uniform linear array as the array length is increased to increase the directivity, the secondary lobes also occur.
- For certain applications, it is highly desirable that secondary lobes should be eliminated completely or reduced to minimum desirable level compared to main lobes.

4. What are the basic principle of antenna synthesis? (AUC, Nov 2016)

Synthesis an array to produce a radiation pattern that closely approximates a specified pattern. This synthesis is called an array pattern synthesis or simply array synthesis or antenna synthesis.

Antenna synthesis is the problem of determining the parameters of an antenna system that will produce a radiation pattern which accurately approximates some desired pattern.

5. What are the condition to obtain end fire array pattern? (AUC, Nov 2012)

(i) Number of identical antennas are spaced equally along a line

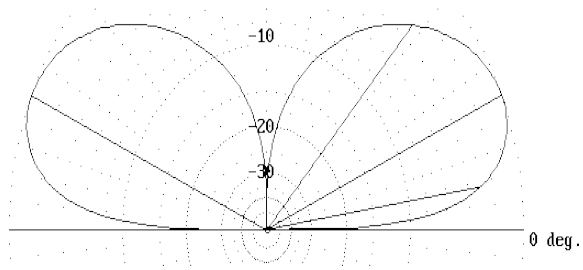
(ii) Individual elements are fed with currents of equal magnitude, but their phases vary progressively along the line.

6. Differentiate broadside and end fire array. (NOV/DEC 2013)

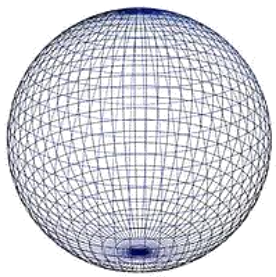
S. No	Broad side array	End fire array
1	Array elements are fed with current of equal amplitude and in phase	Array elements are fed with current of equal amplitude and out of phase, $\delta = -\beta d$
2	Max. radiation is perpendicular to the direction of array axis	Max. radiation is directed along the array axis.
3	BWFN =± 2λ/ηd radians	BWFN =± $2\sqrt{\frac{2\lambda}{\eta d}}$ radians

7. Draw the radiation pattern of a vertical dipole. (AUC, Nov 2014).

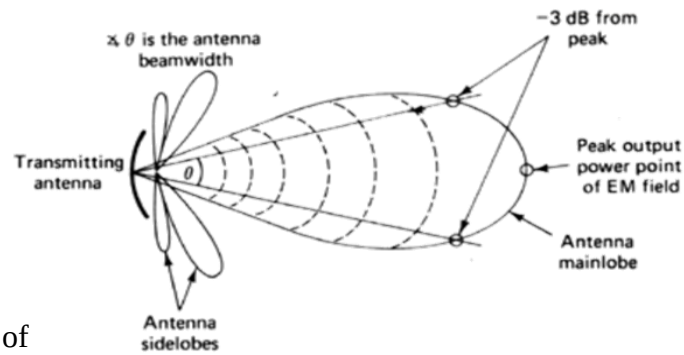
A vertical dipole antenna is simply a dipole antenna that is mounted vertically instead of horizontally. Because of the orientation, it will have some characteristics different than a horizontally mounted dipole.



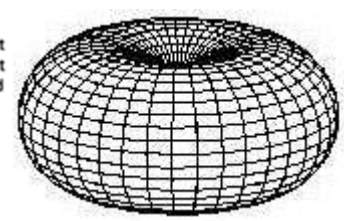
8. Draw the radiation pattern for isotropic, directional and omnidirectional antenna. (AUC, Apr 2017)



(a) Radiation Patterns of Isotropic Antenna



(b) Directional Antenna Pattern



(c) Omnidirectional Pattern

9. A uniform linear array contains 50 isotropic radiation with an inter element spacing of λ/2. Find the directivity of broadside forms of arrays. (AUC, May 2013)

Solution:

Given n=50 and d = λ/2

Therefore Directivity (D) = 2n(d/λ)

D = 2 x 50 x (λ/2λ)

= **50**

D (in dB) = $10log_{10}(50)$ = **16.98 dB**

10. How can we eliminate minor lobes? (Nov 2016)

When the uniform linear array length is increased to increase the directivity, at that time secondary (or) minor lobes also appear along the desired radiation pattern.

To reduce the side lobe level, we use binomial array which deals with the non-uniform amplitude of elements. Here the amplitudes of the radiating sources are arranged according to the coefficients of successive terms of the binomial series.

11. Define BWFN and HPBW.

Beam Width Between First Nulls(BWFN)

At times the effective width of the main beam is given by the angular separation between the nulls around the direction of the maximum radiation is called the BWFN.

Half Power Beam Width (HPBW)

The main beam is the angular region where primarily the radiation goes. The effective width of the antenna main beam called the HPBW is defined as the angular separation between directions where the field strength reduces to (1/√2) of its maximum value.

12. What is Tapering of array? (AUC, Nov 2017)

The techniques used in reduction of side lobe level are called al tapering.

It is found that minor lobes are reduced if the center source radiates more strongly than the end sources (non-uniform current distribution). Hence tapering is done from center to end according to some prescriptions.

13. State Huygens principle. (AUC, Apr 2015).

Huygens's principle state that each point on a primary wave front can be considered to be a new source of a secondary spherical and a secondary wave front can be constructed as envelope these secondary waves.

14. Define Broad Side Array.

An arrangement in which the principal direction of radiation is perpendicular to the array axis and also to the plane containing the array element" is termed as the broad side array

PART B

1. **Derive the expressions for field pattern of broad side array of n point sources. (May 2013)**
   [Ref Book: K.D. Prasad, "Antenna and Wave Propagation", pg. 602, 606-609]
2. **With neat diagram explain the concept of adaptive array.**
   [Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006, pg. 950-954]
3. **Explain the principle of phased array antenna with neat sketch. (AUC, May 2016, Nov 2016)**
   [Text Book: John D Kraus, "Antennas and Wave Propagation", 4th Ed, McGraw Hill, 2012, pg. 216-223]
4. **Obtain the expression for the field and the radiation pattern produced by a N element array of infinitesimal with distance of separation λ/2 and currents of equal magnitude and phase shift 180. (AUC, May 2016)**
   [Ref Book: K.D. Prasad, "Antenna and Wave Propagation", pg. 602, 609-610]
5. **What is the significance of binomial array? Explain with neat diagram. (AUC, Nov 2016)**
   [Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006, pg. 328-331]
6. **Using pattern multiplication determine the radiation pattern for 8 element array, separated by the distance λ/2. (AUC, Apr 2016)**
   [Ref Book: K.D. Prasad, "Antenna and Wave Propagation", pg. 611, 613-614]
7. **Derive the expression for the array factor of a linear array of four isotropic element spaced λ/2 apart fed with signals of equal amplitude and phase. Obtain the directions of maxima and minima. (AUC, Nov 2017).**
   [Ref Book: K.D. Prasad, "Antenna and Wave Propagation", pg. 602, 606-609]
8. **Explain in detail the Binomial array and derive an expression for the array factor. Also obtain the excitation coefficients of a seven-element binomial array. (AUC, Nov 2017)**
   [Ref Book: K.D. Prasad, "Antenna and Wave Propagation", pg. 602, 635-637]
9. **Derive and plot the radiation from a End Fire Array of 4-point sources. (AUC, Nov 2016, Apr 2017).**
   [Text Book: John D Kraus,"Antennas and Wave Propagation", 4th Ed, McGraw Hill, 2012, pg. 297-299]

10. **Describe the principle of phased array and explain how it is used in beam forming. (AUC, Apr 2017).**
    [Text Book: John D Kraus,"Antennas and Wave Propagation", 4th Ed, McGraw Hill, 2012, pg. 216-223]
11. **Write short notes on tapered array and adaptive array.**
    [Ref Book: K.D. Prasad, "Antenna and Wave Propagation", pg.634-635]
    [Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006, pg. 950-954]
12. **Describe the method of pattern multiplication. (AUC, Nov 2014)**
    [Text Book: John D Kraus,"Antennas and Wave Propagation", 4th Ed, McGraw Hill, 2012, pg. 107-112]

UNIT–IV SPECIAL ANTENNAS

PART-A

1. **State Rumsey principle of frequency independence. (AUC, May 2016, Nov 2016, Apr 2017)**

   The condition of the frequency independent antenna was pointed out by V.H. Rumsey. He stated that, "The performance that is, the impedance and pattern properties of a lossless antenna is independent of frequency if the dimensions of the antenna are specified in terms of angles such that they remain constant in terms of wavelength".

2. **What is axial ratio of helical antenna?**

   The ratio of the major to the minor axes of the polarization ellipse is called the Axial Ratio. (AR). For helical antenna, the ratio of magnitude of E_Θ and E_Φ gives the axial ratio.

   Let as defined the axial ratio of helical antenna is AR = $|E\theta / E\phi|$ = $2S\lambda/(\pi^2 D^2)$

3. **What is frequency independent antenna? (AUC, Apr 2014, Nov 2017)**

   An antenna in which the impedance, radiation pattern and directivity remain constant as a function of frequency is called as frequency independent antenna. E.g. log periodic antenna.

4. **Mention the requirements of an ANECHOIC CHAMBER. (AUC, Nov 2013)**
   - Anechoic chamber is an indoor chamber
   - The chamber walls, ceiling and floor are filled with RF energy absorbers except at the location of transmitting antenna and antenna under test(AUT)
   - It is ideal for small antennas
   - It simulates a reflection less free space and allows all-weather antenna measurements in a controlled environment
   - The test area is isolated from interfering signals much better than at outdoor ranges

5. **For a 20 turns helical antenna operating at 3GHz with circumference C=10cm and the spacing between turns 0.3λ, calculate the directivity and half power beam width. (AUC, Nov 2017)**

   Solution:

   Given data are, Number of turns N = 20;

   Operating Frequency f = 3GHz;

   Circumference C = 10cm

   Spacing between turns S = 0.3λ

   $\lambda = C/f = 3\text{x}10^8/3\text{x}10^9 = 0.1$

   The maximum directive gain (Directivity D) is,

   $D = 15\ NSC^2/\lambda^3$

   $D = 15\text{x}20\text{x}0.3\lambda\text{x}(0.1\text{m})^2/\lambda^3$

   $D = 15\text{x}20\text{x}0.3\text{x}0.1\text{x}(0.1\text{m})^2/(0.1)^3 = \mathbf{90}$

   The Half Power Beam Width (HPBW) is,

   $$\text{HPBW} = \frac{52}{C}\sqrt{\frac{\lambda^3}{NS}} = \mathbf{21.22^o}$$

6. **When an antenna is called active antenna?**

   Antenna are typically connected to an amplifier, either for receiving or for transmitting. Herein Active antenna means that an electronic device such as a transistor is inserted into the antenna itself.

7. What is the difference between Yagi uda antenna log periodic dipole array? (AUC, Nov/Dec 2012)

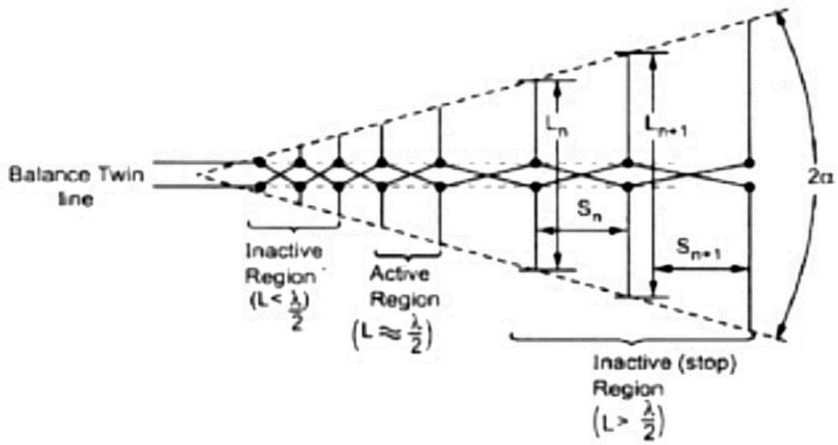
Yagi uda antenna:

Yagi uda antenna has unidirectional beam of moderate directivity with light weight, low cost and simplicity in feed system design. It provides gain of the order of 8db or front to back ratio of about 20 db. If three elements array (i.e., one reflector, one driven element and one director) is used, then such type of Yagi-uda antenna is generally referred to as beam antenna.

Log periodic antenna:

For unidirectional log periodic antenna, the structure fires in backward direction and forward direction is very small or zero. For bidirectional log periodic antenna, the maximum radiation is in broadside direction.

8. Draw the log periodic dipole antenna structures at UHF & VHF ranges.



9. Define LPDA? Why it is called so? (AUC, Nov 2011)

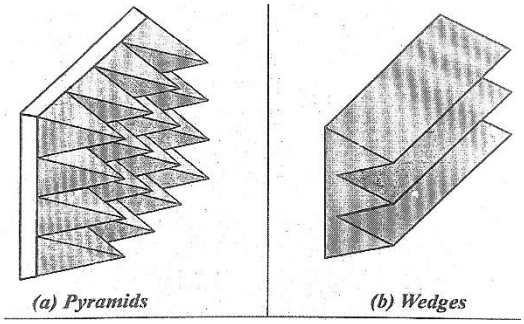
LPDA means log periodic dipole array. It is defined as an antenna whose electrical properties repeat periodically with logarithm of the frequency. The geometry of log periodic antenna is so chosen that electrical properties must repeat periodically with logarithm of frequency.

10. Mention the significance of helical antenna? (AUC, Apr 2014)

- For the space communications applications, the helical antennas are most suitable as they have wide bandwidth, higher directivity and circular polarization.
- To transmit or receive VHF signals through ionosphere generally an array of helical antennas is used. The helical antenna is widely used for space and satellite communications.

11. Compare contrast wedges and pyramids. (AUC, Nov 2016)

The absorbing materials are an integral part of antenna technology. They are used both in measurement ranges and also as antenna components for reducing side-lobe and back-lobe radiations. The widely used shapes are pyramids and wedges as shown below.



Pyramid type absorber is the best option, for normal incidence and they scatter as a random rough surface if they are large compared to the wavelength.

Wedge Shaped absorbers, with wedge direction along the plane of incidence, work perfectly at large angle of incidences but for normal incidence they cannot work satisfactorily compared with pyramidal absorbers.

12. Give any four applications of EBG (AUC, Apr 2017)

Applications of EBG Structure in antenna engineering
(i) Electronically scanned phased arrays, (ii) High precision GPS,
(iii) Bluetooth, (iv) Mobile telephony,

13. Write the basic concept of antenna measurement?

- The antenna under test (AUT) is considered to be located at the origin of the coordinate system.
- The source antenna is placed at different locations with respect to the AUT.
- The source antenna may be transmitting or receiving. To achieve different locations, the number of samples of the pattern are obtained.
- To achieve different locations, the number of samples of the pattern are obtained. To achieve different locations, generally AUT is rotated. To achieve sharp sample of pattern, it is necessary that there exists single direct signal path between the AUT and source antenna.

14. What is meant by Reconfigurable antenna?

A reconfigurable antenna is an antenna which can modify dynamically its frequency and radiation properties in a controlled and reversible manner.

Reconfigurable antennas have the ability to radiate more than one pattern at different frequencies and polarizations which is necessary in modern telecommunication systems.

PART B

1. **Explain the design details of log periodic dipole antenna. (AUC, Nov 2013, May 2015, Nov 2015, May 2016, Nov 2016)**
   [Text Book: John D Kraus," Antennas and Wave Propagation", 4th Edition, Mc Graw Hill, 2012, pg. 435-439]
2. **With neat diagram explain helical antenna and briefly describe its operation in the normal and axial mode. How does it differ from other antennas? (AUC, May 2013, Nov 2013, May 2014, Nov 2014, May 2015, May 2016, Nov 2016)**
   [Text Book: John D Kraus," Antennas and Wave Propagation", 4th Edition, Mc Graw Hill, 2012, pg. 303-312]
3. **With neat block diagram explain how Radiation pattern and Gain of an antenna can be measured? (AUC, May 2013, Nov 2013, Nov 2016, Nov 2017)**
   [Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006, pg. 1021-1025]
4. **Explain the measurement procedure for the measurement of VSWR. (AUC, Apr 2016)**
   [Text Book: John D Kraus," Antennas and Wave Propagation", 4th Edition, Mc Graw Hill, 2012, pg. 734-736]
5. **Explain the concept of electronic band gap structure and give any four applications of EBG. (AUC, Apr 2017).**
   [Ref Book: Constantine A Balanis, "Modern Antenna Handbook", Wiley Edition, pg. 779-783]
6. **Explain the construction and characteristics features of frequency independent antennas. (AUC, Nov 2014)**
   [Text Book: John D Kraus," Antennas and Wave Propagation", 4th Edition, Mc Graw Hill, 2012, pg. 429-431]

7. **Describe construction and radiation characteristics of normal and axial mode helical antenna. (AUC, Nov 2014, Apr 2015, Apr 2016, Nov 2016)**
   [Text Book: John D Kraus," Antennas and Wave Propagation", 4th Edition, Mc Graw Hill, 2012, pg. 303-312]
8. **Explain the construction and principle of operation of Log periodic antenna with neat schematic diagram. (AUC, Nov 2013, Apr 2015, Apr 2016, Nov 2016)**
   [Text Book: John D Kraus," Antennas and Wave Propagation", 4th Edition, Mc Graw Hill, 2012, pg. 435-439]
9. **Show the experimental setup for measuring the unknow load impedance using VSWR method and explain. (AUC, Apr 2017)**
   [Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006, pg. 1036-1038]
10. **With suitable diagram explain the construction and principle of spiral antenna.**
    [Text Book: John D Kraus," Antennas and Wave Propagation", 4th Edition, Mc Graw Hill, 2012, pg. 431-435]
11. **Explain the procedures involved in the measurement of gain in antennas. (AUC, Nov 2016)**
    [Ref Book: Constantine A Balanis, "Antenna Theory Analysis and Design", Wiley 3rd Edition, 2006, pg. 1028-1034]
12. **Write short notes on, (i) Reconfigurable antenna, (ii) Active antenna, (iii) Dielectric antenna.**
    [Ref Book: Constantine A Balanis, "Modern Antenna Handbook", Wiley Edition, pg. 369-373]

UNIT – V PROPAGATION OF RADIO WAVES

PART-A

1. **Differentiate virtual height from actual height. (AUC, May 2014)**

Virtual height of an ionosphere layer may be defined as the height to which a short pulse of energy sent vertically upward and travelling with the speed of light would reach taking the same two ways travel time as done the actual pulse reflected from the layer.

Virtual height, h = cT/2

The height at a point above the surface at which the wave bends down to the earth is called actual height.

2. **Define Optimum Working Frequency. (AUC, May 2015)**

It is observed that due to daily continuous changes and irregularities in the ionosphere, the Maximum Usable Frequency (MUF) varies about 15% of its maximum value. Hence practically the frequency used should be 15% less than the value of MUF. Thus, the frequency normally used for the ionospheric propagation is known as Optimum Working Frequency.

3. **Find the range of LOS system when the receive and transmit antenna heights are 10 m and 100 m respectively. Take the effective earth's radius into consideration. (AUC, May 2016)**

Solution:

Given, Transmitting antenna height = h_T = 100m

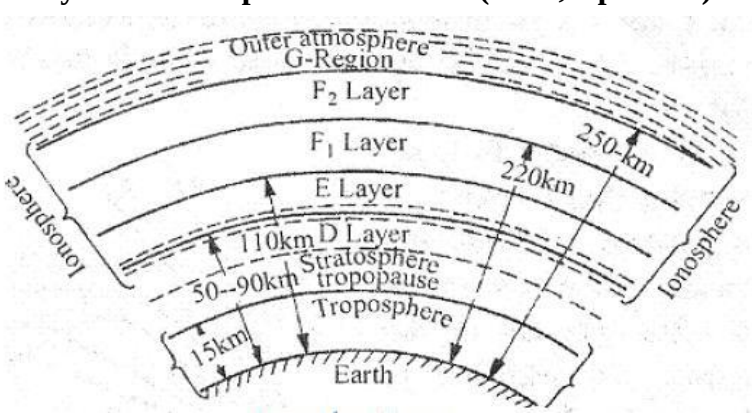
Receiving antenna height = h_R = 10m

LOS distance = $4.12(\sqrt{h_T} + \sqrt{h_R})$ **= 54.21km**

4. **Define Skip Distance. (AUC, Nov 2017)**

Skip Distance is defined as, "The minimum distance from the transmitter at which a sky wave of given frequency is returned to earth by the ionosphere" (or) "The minimum distance from the transmitter to a point where sky wave of a given frequency is first received". It is represented by D

5. **Draw various layers of atmospheric structure. (AUC, Apr 2017)**



6. **Brief about Maximum Usable Frequency.**

The maximum, frequency that can be reflected back for a given distance of transmission is called the maximum usable frequency (MUF) for that distance. It is seen that the MUF is related to the critical frequency and the angle of incidence by the simple expression,

$MUF = f_c \sec(i)$;

where, f_c-> critical frequency

The MUF for a layer is greater than the critical frequency by the factor $sec\varphi_i$ the largest angle of incidence φ_i that can be obtained in F-layer reflection is of the order of 74°.

7. Find the critical frequency of an ionosphere layer which has an electron density of $1.24x10^6$ cm^{-3}. (AUC, Nov 2016).

Solution

Given Maximum electron density N_{max} $=1.24x10^6$ cm^{-3} = 1.24 m^{-3}

Critical Frequency $f_C = 9x\sqrt{N_{max}}$

$= 9\sqrt{1.24}$ = **10.026MHz**

8. Define Critical Frequency. (AUC, Apr 2017)

The critical frequency fc of an ionized layer is defined as the highest frequency which can be reflected by a particular layer at vertical incidence. It is different for different layer.

$$f_c = \sqrt{81\ N_{max}}$$

Where, N_{max} = Maximum electron density in the layer.

9. The critical frequency for an ionized layer is 5MHz. determine the electron density of the layer. (AUC, Nov 2017)

Solution

Given, Critical frequency f_C = 5MHz

Electron Density of the layer $N_{Max} = \sqrt{\frac{f_C}{81}} = \sqrt{\frac{5x10^6}{81}}$ = 248.452 m^{-3}

10. What is meant by duct propagation? (AUC, May 2013, Nov 2016)

A normal or standard atmosphere is one where the dielectric constant is assumed to decrease uniformly with height to a value of unity at a height where air density is essentially zero.

These conditions besides giving phenomenon of scattering, refraction and reflection, give a new phenomenon called super refraction or duct propagation.

(or)

The higher frequencies or microwaves are thus continuously refracted in the duct and reflected by the ground so that they propagate around the curvature for beyond the line of sight, even up to a distance of 1000km. This special refraction of electromagnetic waves is called super refraction and the process is called duct propagation.

11. Give specific features of troposcatter propagation? (AUC, Apr 2016)

The specific features of troposcatter propagation are:

(i) The tropospheric scattering phenomenon can be used to establish a communication link over a distance much beyond the radio horizon.
(ii) Tropospheric scatter propagation is used for poin to point communications.
(iii) A correctly designed tropospheric scatter circuit will provide highly reliable service for distances ranging from 50 miles to 500 miles.
(iv) Troposcatter can be used to establish communication links in the UHF and microwave frequency bands and distance coverage is up to 1000km.

12. What are the factors that affect radio wave propagation? (AUC, Nov 2014)

(i) Curvature of earth.
(ii) Earth' s magnetic field.
(iii) Frequency of the signal.
(iv) Plane earth reflection.

13. Write brief note on sporadic E layer in Ionosphere?

Sporadic E layer is an anomalous ionization layer in Ionosphere. It is usually occurred in the form of clouds, varying size from 1km to several 100 km across.

14. What is meant by Faraday rotation? (AUC, Apr 2015)

Any linearly polarized wave may be considered as the vector sum of two anti-rotating circularly polarized waves. If such a wave propagates in the direction of magnetic field, then the two circularly polarized components will travel at different phase velocities and thus the plane of polarization will rotate with distance. This phenomenon is known as Faraday's rotation.

PART B

1. **Describe the structure of the atmosphere and specify the factors affecting the radio wave propagation. (AUC, Nov 2017)**
   [Ref Book: K.D. Prasad, "Antenna and Wave Propagation", pg. 1114-1116]

2. **Explain the following terms with neat diagram: (i) Critical frequency, (ii) Skip Zone, (iii) Multihop propagation, (iv) whistlers. (AUC, Nov 2013, Apr 2014, Apr 2015)**
   [Ref. Book: Edward C. Jordan and Keith G. Balmain" Electromagnetic Waves and Radiating Systems" Prentice Hall of India, 2006, pg. 673, 677, 685, 694]

3. **Discuss the effects of earth's magnetic field on ionosphere radio wave propagation. (AUC, Apr 2016).**
   [Ref. Book: R.E. Collin, "Antennas and Radiowave Propagation", Mc Graw Hill 1985, pg.395-400]

4. **Draw the structure of ionosphere and explain the mechanism of tropospheric propagation. (AUC, Apr 2015)**
   [Ref. Book: R.E. Collin, "Antennas and Radiowave Propagation", Mc Graw Hill 1985, pg.419-425]

5. **Explain the effect of EM waves in curved earth and flat earth configurations. (AUC, Apr 2017)**
   [Ref. Book: R.E. Collin, "Antennas and Radiowave Propagation", Mc Graw Hill 1985, pg. 341-352]

6. **Explain the attenuation characteristics for ground wave propagation. (AUC, Nov 2016)**
   [Ref. Book: R.E. Collin, "Antennas and Radiowave Propagation", Mc Graw Hill 1985, pg.377-388]

7. **Explain how EM waves are propagated in troposphere layer and discuss the principle of troposcatter propagation. (AUC, Apr 2017).**
   [Ref. Book: R.E. Collin,"Antennas and Radiowave Propagation", Mc Graw Hill 1985, pg.419-425]

8. **Describe the structure of the atmosphere and explain each layer in detail. (AUC, Apr 2016)**
   [Ref Book: K.D. Prasad, "Antenna and Wave Propagation", pg. 1114-1115, 117-1119]

9. **Explain the terms (i) Maximum Usable Frequency, (ii) Virtual Height, (iii) Duct Propagation, (iv) Skip Distance, (v) Fading. (AUC, Apr 2015)**
   [Ref Book: K.D. Prasad, "Antenna and Wave Propagation", pg. 1136-1140, 1144, 1147]

10. A mobile link has to be established between two points spaced away 1500 km via ionosphere layer of density 4.5×10^6 cm^{-3} at a height of 150 km. Calculate the maximum usable frequency which can be communicated, critical frequency and skip distance. (AUC, Apr 2017).

Solution

Given data's, Distance between mobile link, D = 1500 Km

Max. Electron density (in m^{-3}) $N_m = 4.5 \times 10^6$ cm^{-3}

$= 4.5 \times 10^6 \times 10^{-6}$ m^{-3}

Height (h) = 150 Km

Critical Frequency (f_C) = 9√(Nm) = 9√(4.5) = **19.09 MHz**

Maximum Usable Frequency (f_{MUF}) = $f_c\sqrt{1+\left(\frac{D}{2h}\right)^2} = 19.09\sqrt{1+\left(\frac{1500}{2X150}\right)^2} = \mathbf{97.34\ MHz}$

Skip Distance (D_{skip}) = $2h\sqrt{\left(\frac{f_{MUF}}{f_C}\right)^2 - 1} = 2 * 150\sqrt{\left(\frac{97.34}{19.09}\right)^2 - 1} = \mathbf{1499.99\ Km}$

11. Explain LOS propagation and ground wave propagation. (AUC, Nov 2016)
[Ref Book: K.D. Prasad, "Antenna and Wave Propagation", pg. 1112-1114]

12. Obtain an expression for the refractive index of an ionosphere layer. (AUC, Nov 2017)
[Ref Book: K.D. Prasad, "Antenna and Wave Propagation", pg. 1119-1121]

ANNA UNIVERSITY PREVIOUS YEAR QUESTION PAPERS

B.E./B Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Sixth Semester

Electronics and Communication Engineering

EC 6602 — ANTENNA AND WAVE PROPAGATION

(Regulations 2013)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Determine the electric field intensity at a distance of 10 km from a dipole antenna of directive gain of 6 dB and radiating power of 20 kW.

2. Define gain of an antenna. Mention the relationship between gain and aperture of an antenna.

3. Using pattern multiplication find the radiation pattern for the broadside array of 4 elements, spacing between each element is $\lambda/2$.

4. Draw the radiation pattern of an isotropic point sources of same amplitude and same phase that are $\lambda/2$ apart along X axis symmetric with respect to origin.

5. What are the different types of horn antenna?

6. State Rumsey principle.

7. Mention any four advantages of microstrip antenna.

8. Draw the radiation pattern for isotropic, directional and omnidirectional antenna.

9. Define critical frequency.

10. Draw the various layers of atmospheric structure.

PART B — (5 × 16 = 80 marks)

11. (a) Derive an expression for the power radiated by the current element and calculate the radiation resistance. (16)

Or

(b) Derive an expression for the far field component of a half wave dipole of an antenna. (16)

12. (a) (i) Explain the principle of reflector antenna and the different types of feed used in a reflector antenna. (10)

(ii) Explain the working principle of microstrip patch antenna. (6)

Or

(b) (i) A pyramidal horn antenna with the aperture length of 10 λ cm is fed by a rectangular waveguide in TE_{10} mode. Determine the design parameters of the antenna operating at 2.5 GHz. (10)

(ii) Compare the slot and dipole antenna (6)

13. (a) Derive and draw the radiation pattern of 4 isotropic sources of equal amplitude and same phase. (16)

Or

(b) (i) Describe the principle of phased arrays and explain how it is used in beam forming (10)

(ii) Write short notes on binomial arrays. (6)

14. (a) Design a log periodic dipole antenna to cover all the VHF TV channels from 55 MHz to 220 MHz. The required directivity is 9 dB and input impedance is 50 Ω. The elements should be made of aluminum tubing with 2.0 cm outside diameters for the largest element and the feeder line and 0.48 cm for the smallest element. These diameters yield identical (l/d) ratios for smallest and largest elements. (16)

Or

(b) (i) Show the experimental setup for measuring the unknown load impedance using VSWR method and explain. (8)

(ii) Explain the concept of electronic band gap structure and give any four applications of EBG. (8)

15. (a) Explain how the EM waves are propagated in troposphere layer and discuss the principle of troposcatter propagation. (8 + 8)

Or

(b) (i) Explain the effect of EM waves in curved earth and flat earth configuration. (8)

(ii) A mobile link has to be established between two points spaced away 1500 km via ionosphere layer of density 4.5×10^6 cm^{-3} at a height 150 km Calculate the maximum frequency which can be communicated, critical frequency and skip distance. (8)

Reg. No. :

Question Paper Code : 50448

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Sixth Semester

Electronics and Communication Engineering

EC 6602 – ANTENNA AND WAVE PROPAGATION

(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions :

PART – A (10×2=20 Marks)

1. An antenna has a field pattern given by $E(\theta) = \cos^2(\theta)$ for $0° \le \theta \le 90°$. Find HPBW.

2. Differentiate Radian and Steradian.

3. State Babinet's principle.

4. What are secondary antennas ? Give two examples.

5. State pattern multiplication.

6. What is tapering of arrays ?

7. For a 20 turn helical antenna operating at 3GHz with circumference C = 10 cm and the spacing between the turns 0.3λ, calculate the directivity and half-power beam width.

8. What is a frequency independent antenna ?

9. The critical frequency for an ionised layer is 5 MHz. Determine the electron density of the layer.

10. Define skip distance.

PART – B (5×16=80 Marks)

11. a) i) Draw a neat sketch of a 3 element Yagi-Uda antenna and explain its principle of operation. (12)

ii) Two half-wave vertical dipole antenna each with a gain of 1.64 are horizontally separated by a distance 100 km to form a transmitter – receiver link. The transmitter feeds its antenna with 10 W at 100 MHz. Calculate the power received by the other antenna. (4)

(OR)

b) Derive the field equations for an oscillating dipole starting from Maxwells equations. Derive the expression for its radiation resistance. (16)

12. a) i) Explain the principle of parabolic reflector antenna and discuss on different types of feed used with neat diagram. (12)

ii) The diameter of a parabolic reflector is 2m. For operation at 6GHz, find the beam width between first nulls and the gain. (4)

(OR)

b) Write short notes on :

i) Slot antenna. (8)

ii) Microstrip antenna. (8)

13. a) Derive the expression for the array factor of a linear array of four isotropic element spaced $\lambda/2$ apart fed with signals of equal amplitude and phase. Obtain the directions of maxima and minima. (16)

(OR)

b) i) Explain in detail the Binomial array and derive an expression for the array factor. Also obtain the excitation coefficients of a seven element binomial array. (14)

ii) What is phased array ? (2)

14. a) Design a 50 to 200MHz log periodic dipole antenna for gain corresponds to scale factor 0.8 and space factor. 0.15. Assume the gap spacing at the smallest dipole is 3.6 mm. **(16)**

(OR)

b) With a neat block diagram, explain the radiation pattern and gain of an antenna can be measured. **(16)**

15. a) Describe the structure of the atmosphere and specify the factors affecting the radio wave propagation. **(16)**

(OR)

b) i) Discuss briefly on the types of fading. **(7)**

ii) Obtain an expression for the refractive index of an ionospheric layer. **(9)**

SYLLABUS

EC6001 MEDICAL ELECTRONICS L T P C

3 0 0 3

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

The origin of Bio-potentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, lead systems and recording methods, typical waveforms and signal characteristics

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

pH, PO2, PCO2, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood Cell Counters

UNIT III ASSIST DEVICES 9

Cardiac pacemakers, DC Defibrillator, Dialyser, Heart lung machine

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY 9

Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy Telemetry principles, frequency selection, biotelemetry, radiopill, electrical safety

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Thermograph, endoscopy unit, Laser in medicine, cryogenic application, Introduction to telemedicine.

TOTAL PERIODS: 45

TEXT BOOKS:

T1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007

T2. John G.Webster, “Medical Instrumentation Application and Design”, 3rd Edition, Wiley India Edition, 2007

REFERENCES:

R1. Khandpur, R.S., “Handbook of Biomedical Instrumentation”, TATA Mc Graw-Hill, New Delhi, 2003.

R2. Joseph J.Carr and John M.Brown, “Introduction to Biomedical Equipment Technology”, John Wiley and Sons, New York, 2004.

UNIT-I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING

PART-A

1. **List the lead systems used in ECG recording. (Apr/May 2010)**
   The lead systems used in ECG recording are
   a) Bipolar Limb leads or Standard leads
   b) Augmented unipolar limb leads
   c) Chest leads or precordial leads

2. **Write the Nernst equation with its parameter description?**
   $V_R = -KT/q \ln[[K^+]_I / [K^+]_O]$
   V_R – Resting potential,K-Boltzmann Constant,T – Absolute temperature in Kelvin
   q - Charge of an electron

3. **State all or none law in respect of cell bio potential. (Apr/May 2008)**
   Regardless of the method by which a cell is excited or the intensity of the stimulus, the action potential is always the same for any given cell.

4. **Define – Conduction Velocity. (Apr/May 2008, Nov/Dec 2008,May/June 2007)**
   Conduction velocity is defined as the rate at which an action potential moves down a fiber or is propagated from cell to cell. It is also called as Nerve conduction rate.

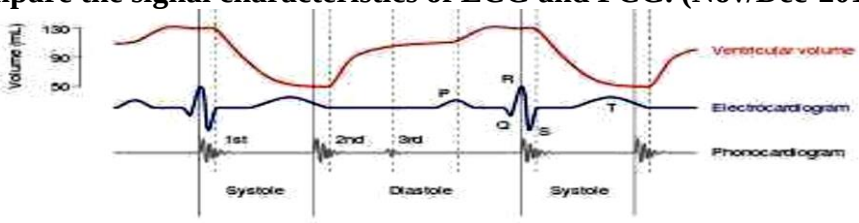
5. **What is PCG? (May/June- 2012, Nov/Dec -2012)**
   A Phonocardiogram or PCG is a graphic display of the sounds generated by the heart and picked up by a microphone at the surface of the body. Frequency response required is 5 to 2000 Hz. It is measured by special transducer or microphone.

6. **What are the types of electrodes used in bipolar measurement? (May/June- 2012)**
   The types of electrodes used in bipolar measurement are
   a) Limb electrodes
   b) Floating Electrodes
   c) Skin electrodes

7. **Name the electrodes used for recording EMG and ECG. (Nov/Dec-2012)**
   Electrodes used for recording EMG are
   a) Needle electrodes
   b) Surface electrodes
   Electrodes used for recording ECG are
   d) Limb electrodes
   e) Floating Electrodes

8. **Define a) Resting Potential b) Action Potential.(May/June 2009, Nov/Dec 2008)**
   Resting potential is defined as the electrical potential of an excitable cell relative to its surroundings when not stimulated or involved in passage of an impulse. It ranges from -60mV to -100mV
   Action potential is defined as the change in electrical potential associated with the passage of an impulse along the membrane of a cell. **2.**

9. Compare the signal characteristics of ECG and PCG. (Nov/Dec-2011)



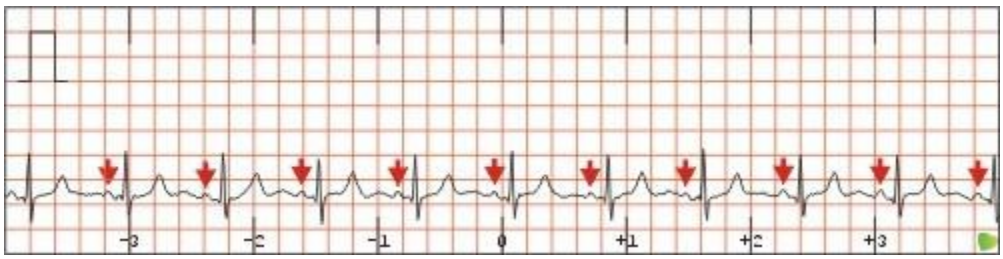
10. What is EOG? Nov/Dec-2011

Electrooculogram is the measure of the variations in the corneal – retinal potential as affected by the position and movement of eye. The EOG potentials are picked up by small surface electrodes placed on the skin near the eye.

11. Define latency as related to EMG. Nov/Dec 2008

Latency is defined as the elapsed time between the stimulating impulse and the muscle action potential. In other words it is the time delay between stimulus and response.

12. Draw typical ECG waveform. Nov/Dec 2009,May/June 2007



13. What are the important bands of frequencies in EEG and state their importance. Nov/Dec 2004

Waves	Frequency (Hz)	Observation
Delta(δ)	0.5 – 4	These wave occur in deep sleep in premature babies and in very serious organic brain disease.
Theta(θ)	4 – 8	These wave occurs during emotional stress in some adults particularly during disappointment and frustration
Alpha(α)	8 – 13	They found in the normal persons when they are awake in a quiet, resting state. During sleep they disappear.
Beta(β)	13- 22	It is observed when the person is alert active, busy, or anxious thinking, active concentration

14. Name the electrodes used for recording EMG and ECG. (Nov/Dec-2012)

Electrodes used for recording EMG are
a) Needle electrodes
b) Surface electrodes
Electrodes used for recording ECG are
d) Limb electrodes
e) Floating Electrodes
f) Pregelled disposable electrodes
g) Pasteless electrodes

PART-B

1. **Discuss the different types of biopotential electrodes used in the measurement of biosignals?**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 67

2. **Explain in detail about the EEG recording setup and 10-20 electrode placement and EEG waveform characteristics.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 297

3. **Write in detail about the different techniques used for measuring the cardiac output?**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 150

4. **What is a blood flow meter? Explain in detail about Electromagnetic blood flow meter and Doppler blood flow meter.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 155

5. **Draw and explain the different lead configurations and its significance in ECG .**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 114

6. **Draw the block diagram of a Biomedical instrument system and briefly explain its components**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 2-12

7. **Explain in detail about the ECG recording setup and 12 lead system?**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 114

8. **Explain in detail about 3 bioelectric amplifiers?**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No:

9. **Explain in detail about the direct and indirect measurement of blood pressure?**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 126

10. **Write in detail about i) pulse oximetry ii) Auto analyzer.**
    Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 358

11. **Discuss in detail about the origin of action and resting potential with necessary equation.**
    Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 50

12. **Explain in detail about EEG machine and show the recording methods of unipolar and bipolar EEGs.**
    Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No:296

UNIT-II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT

PART-A

1. **What are the typical values of blood pressure and pulse rate of an adult? (Nov/Dec.2012)**
   Systolic (maximum) blood pressure in the normal adult is in the range of 95 to145 mm Hg, with 120 mm Hg being average. Diastolic (lowest pressure between beats) blood pressure ranges from60 to 90 mm Hg, 80 mm Hg being average.

2. **What are systolic and diastolic pressures? (Nov/Dec 2011)**
   The heart's pumping cycle is divided into two major parts systole and diastole. Systole is defined as the period of contraction of the heart muscles specifically the ventricular muscle at which time blood is pumped into the pulmonary artery and the aorta. Systolic pressure is 120 mm Hg(average value). Diastole is the period of dilation of the heart cavities as they fill with blood. Diastolic pressure is 80 mm Hg (average value).

3. **What is the reason for decrease of cardiac output?**
   The reason for decrease of cardiac output may be due to low blood pressure, reduced tissue oxygenation, poor renal function, shock and acidosis.

4. **What is residual volume? (May /June 2007)**
   Residual volume is the volume of gas remaining in the lungs at the end of maximum expiration.

5. **Define – Vital Capacity**
   The vital capacity (VC) is the maximum volume of gas that can be expelled from the lungs after a maximal inspiration.

6. **How cardiac output is is used?**
   Using implanted electromagnetic fine probe on the aorta, find the cardiac output per minute directly can be found by multiplying the stroke volume with the heart beat rate per minute.

7. **How is auto analyzer useful in medical field? (April /May 2010)**
   Auto analyzer is used to measure blood chemistry and display that on a graphic recorder.

8. **What are korotkoff sounds? (Nov/Dec 2008)**
   In the Blood pressure (BP) measurement, when the systolic pressure exceeds the cuff pressure, then the doctor can hear some crashing, snapping sounds through the stethoscope. These sounds are called as korotkoff sounds.

9. **What is cardiac output?What are the methods of measurement of cardiac output? (Nov/ Dec 2004).**
   Cardiac output is the amount of blood delivered by the heart to the aorta per minute. For normal adult, the cardiac output is 4- 6 litres/min. The cardiac output is measured by using three methods. They are Fick's Method, Indicator dilation method, Measurement of cardiac output by impedance change.

10. State the principle behind the indicator dilution method

The indicator dilution method is based on the principle that a known amount of dye or radio isotope as an indicator is introduced with respect to time at the measurement site, so the volume flow of blood can be estimated.

11. What are the two methods of pulse measurement?

The methods used for measuring pulse are transmittance and reflectance methods.

12. What is the reason for decrease of cardiac output?

The reason for decrease of cardiac output may be due to low blood pressure, reduced tissue oxygenation, poor renal function, shock and acidosis.

13. Define – Tidal Volume

Tidal volume is also called as normal depth volume of breathing or is the volume of gas inspired or expired during each normal quiet respiration cycle.

14. What is electrophoresis?

Electrophoresis is a method for separating and analyzing macromolecular substances such as plasma proteins. The method is based on the fact that, the molecules carry electric charges and therefore migrate in a electric field.

PART-B

1. **Discuss briefly about the measurement of pulse rate using various methods.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 326

2. **Examine the principle of following:**
   (i) Filter Photometer
   (ii) Auto analyser
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 50

3. **Describe about spirometer and blood cell counter with neat block diagram.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 223-227

4. **Explain the working principle of electromagnetic blood flow meter.What is its advantages and disadvantages?**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 155

5. **Analyze the measurement of blood pH value.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 151

6. **Classify the temperature measurement methods**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No:244

7. **Summarize how the respiratory measurement is carried out using respiratory apparatus.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No:220

8. **Illustrate the following techniques with necessary diagram:**
   (i) pCO2 measurement principle (7)
   (ii) Dye dilution (6)
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 157

9. **List and identify the principle of operation of blood cell counter types and its applications.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 347-349

10. **Explain the working principle of electromagnetic blood flow meter.What are its advantages and disadvantages?**
    Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 155

11. **Evaluate the measurement of cardiac output using direct and indirect methods.**
    Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No:98

12. **Integrate the measurement of blood pressure using direct and indirect methods.**
    Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 135,126

UNIT-III ASSIST DEVICES

PART-A

1. **Give two important factors that demand internal pace maker's usage.**

   The two important factors that demand internal pace maker's usage are

   (i) Type and nature of the electrode used

   (ii) Nature of the cardiac problems.

   (iii) Mode of operation of the pacemaker system.

2. **Classify Pacing modes.**

   Based on the modes of operation of the pacemakers, they can be classified into five types. They are:

   i) Ventricular asynchronous pacemaker(fixed rate pacemaker)

   ii) Ventricular synchronous pacemaker

   iii) Ventri defibrillator inhibited pacemaker (demand pacemaker)

   iv) Atrial synchronous pacemaker

   v) Atrial sequential ventricular inhibited pacemaker

3. **Distinguish between Internal and External pacemakers.**

   External pacemakers: It does not require open chest surgery,No safety for the pace maker,Endocardiac electrodes are applied to the heart.

   Internal pacemakers : It does not require open chest minor surgery, 100% safety, Myocardiac electrodes are in contact with the outer wall of the myocardium.

4. **What are the batteries used for implantable pacemaker?**

   The batteries used for implantable pacemakers are

   (i)Mercury cell

   (ii) Lithium cells

   (iii)Nuclear

5. **What is meant by fibrillation?**

   The condition at which the necessary synchronizing action of the hrart is lost is known as fibrillation. During fibrillation the normal rhythmic contractions of either atria or the ventricles are replaced by rapid irregular twitching of the muscular wall.

6. **What types of electrodes are used in a defibrillator?**

   The electrodes used in a defibrillator are

   (i)Internal electrodes - Spoon shaped

   (ii)External electrodes -Paddle shapped

7. **Calculate the energy stored in 16µF capacitor of a DC defibrillator that is charged to a potential of 5000 Vdc.**

   Given Data:

   $C = 16\mu F$

   $V = 5000$

   $E = (1/2)\ CV^2$

   $= (1/2) \times 16 \times 10^{-6} \times 25 \times 10^{6}$

   E =**200 Joules**

8. What is heart lung machine?

The machine can provide extra corporal circulation to the patient is known as heart lung machine.

9. What is Dialysis?

Dialysis is a process by which the waste products in the blood are removed and restoration of normal pH value of the blood is obtained

10. What is the use of proportioning pump?

It is used to mix the pure water with dialysate. Usual ratio of water and concentrate is 34:1.

11. Differentiate two types of dialysis

S.No	Extra Corporeal Dialysis	Intra Corporeal Dialysis
1.	Blood is purified by an artificial kidney machine. In which blood is taken out from the body and waste products diffuse through a semi permeable membrane which is continuously rinsed by a dialysing solution	The peritoneal cavity in our body is used as semi permeable membrane and by passing he dialysate into it, waste products are removed from the blood by diffusion
2.	More effective for separating the waste products	Less effective
3.	Complex and risk, because blood is taken out from the body	Simple and risk free
4.	Dialysing time is about 3 to 6 hours	Dialysing time is about 9 to 12 hours

12. Write the principle of heamodialysis.

Blood is purified by an artificial kidney machine in which blood is taken out from the body and waste products diffuse through a semi-permeable membrane which is continuously rinsed by a dialysing solution.

13. Distinguish a defibrillator from a pacemaker.

Defibrillator	**pacemaker**
It is an electronic device that creates a sustained myocardial depolarization of a patient heart in order to stop the fibrillation	It is an device capable of generating artificial pacing impulses and delivering them to the heart.

14. What are pacemakers?

Pacemakers means electrical pulse generator for stsrting and/or maintaining the normal heart beat. The output of pacemaker is applied either externally to the chest or internally o the heart.

PART-B

1. **Explain in detail the principle block diagram and working of haemodialyser**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No:359

2. **Explain A.C defibrillator with neat diagram.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No:206-212

3. **Write short notes on: i)Micro shock hazards ii) Macro shock hazard**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No:430

4. **Explain in detail about oxygenator**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 217

5. **Describe the atrial synchronous pacemaker.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 200

6. **Generalize points about the working and types of a dialyzer?**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 359

7. **With a neat diagram explain the block diagram of arterial and ventricular triggered pacemaker.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 190

8. **Explain D.C defibrillator with neat diagram.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 206-212

9. **What is biotelemetry? Explain in detail about the different types of biotelemetry**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 317

10. **Explain in detail about shortwave and ultrasound diathermy**
    Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 217

11. **Discuss with neat diagrams R-wave inhibited pacemaker**
    Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 201

12. **Discuss with neat diagrams R-wave triggered pacemaker**
    Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No:201

UNIT-IV PHYSICAL MEDICINE AND BIOTELEMETRY

PART-A

1. **What is meant by diathermy?**
   Diathermy is the treatment process by which, cutting coagulation of tissues are obtained.

2. **List the types of diathermy.**
   The types of diathermy are
   i)Short wave diathermy
   ii)Microwave diathermy
   iii)Ultrasonic diathermy
   iv)Surgical diathermy

3. **What are the types of thermography?**
   The types of thermography are
   i). Infrared thermography
   ii) Liquid crystal thermography
   iii). Microwave thermography

4. **What are the different types of current that are used for medical applications?**
   The different types of current are Threshold current, pain current, let-go current, paralysis current, fibrillation and defibrillation current.

5. **Define - Endoscopes and mention some of its types.**
   Endoscope is a tubular optical instrument to inspect or view the body cavities which are not visible to the naked eye normally.
   Types of endoscopes are cardioscope, bronchoscope, laparoscope, otoscope, gastroscope etc.

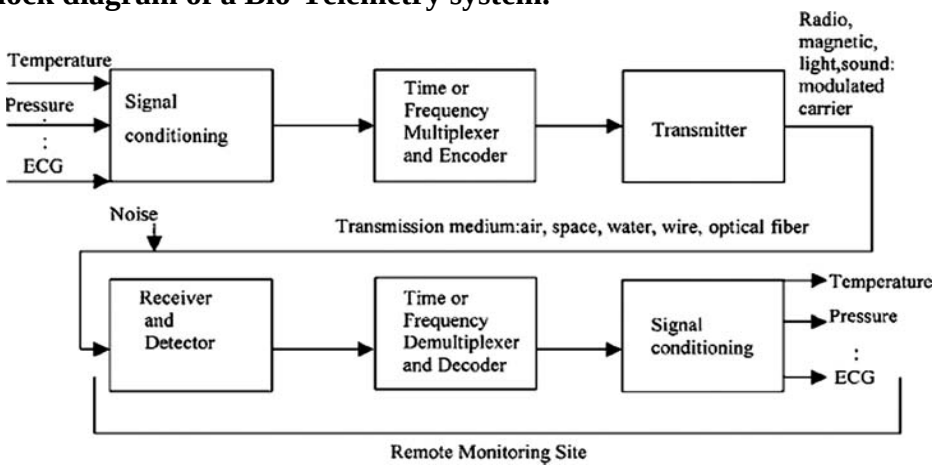
6. **What are the devices used to protect against electrical hazards?**
   i)Ground fault interrupt
   ii). Isolation transformer

7. **What are the two methods of shortwave diathermy?**
   The two methods of shortwave diathermy are
   i)Capacitive method
   ii) Inductive method

8. **What is the modulation techniques used for biotelemetry? Mention the reason for adopting that modulation scheme.[N/D 2004].**
   The two different modulation techniques used for biotelemetry are
   i)Double Modulation
   ii)Pulse Width Modulation

9. **What is the principle of telestimulation?**
   Telestimulation is the measurement of biological signals over long distance

10. Draw the block diagram of a Bio-Telemetry system.



11. What are the advantages of biotelemetry system?

The advantages of biotelemetry systems are

(i) It is used to record the bio signals over long periods

(ii) The medical attendant or computer can easily diagonise the nature of Disease by seeing the telemeter biosignals without attending patient Room

(iii) Patient is not disturbed during recording

(iv) For recording on animals, particularly for research, the biotelemetry is greatly used

12. Specify the frequencies used for biotelemetry

Wireless telemetry system uses modulating systems for transmitting biomedical signals. Two modulators are used here. A lower frequency sub-carrier is employed in addition to very-high frequency (VHF). This transmits the signal from the transmitter

13. What is a radio-pill?

The radio pill is capable of measuring various parameters that are available in the tract. With the help of radio pill type devices, it is possible for us to measure or sense temperature, pH, enzyme activity and oxygen tesion values. These measurements can be made in association with transducers. Pressure can be sensed by using variable inductance and temperature can be measured by using temperature-sensitive transducer.

14. Define counter shock.

The phenomenon of application of an electrical shock to resynchronize the heart is known as counter shock.

PART-B

1. **With a neat block diagram show the operation of a combined single channel telemetry system for ECG signal and respiration rate.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No:337

2. **Explain in detail about shortwave and ultrasound diathermy?**
   Refer Medical Electronics by "R L Reka" page No: 4.2

3. **What is a dialyzer? Explain in detail about haemodialyser and peritoneal dialyzer.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 247

4. **Describe the physiological effects of electricity on humans and write short notes on frequency selection for telemetry applications.**

Refer **Biomedical Instrumentation and measurements** by **"Leslie Cromwell" page No:317**

5. **Enumerate the salient features of microwave diathermy**

Refer **Medical Electronics** by **"R L Reka" page No:** 4.4

6. **Explain the working and application techniques of shortwave diathermy, ultrasonic diathermy.**
   Refer Medical Electronics by "R L Reka" page No: 4.4

7. **What is biotelemetry? Explain in detail about the different types of biotelemetry.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 317

8. **Draw the block diagram of radio pills and explain in detail and also write about the physiological monitoring system in space station.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No:187

9. **Differentiate micro shock and macro shock and write the Hazards related to that, devices used to protect it.**
   Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 432

10. **Generalize the problems associated with the implant telemetry circuits? Explain the subcarrier biotelemetry?**
    Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 317

11. **Elaborate the multiple channel telemetry systems with neat diagrams.**
    Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 317

UNIT-V RECENT TRENDS IN MEDICAL INSTRUMENTATION

PART-A

1. **What is medical thermography? Mention its applications.**

Thermography is the process of recording true thermal image of the surfaces of objects under study. It displays images representing the thermal radiation of skin areas. Thermogram contain both qualitative and quantitative information relevant to the image itself and to temperature.

Medical applications of thermography

i)Tumors
ii) Inflammation
iii) Diseases of peripheral vessels
iv) Orthopedic diseases

2. **List the types of lasers used in medical field. .(Nov/Dec 2012)**

The types of lasers used in medical fields are

i). Pulsed Nd-YaG laser
ii). Continuous laser. Co2 laser
iii). Continuous wave organ ion laser

3. **What are the advantages of performing surgery using LASER?**

The advantages of performing surgery using LASER are

i)Highly sterile
ii) Non-contact surgery
iii)Highly localized and precise
iv)prompt surgery
v)short period of surgical time

4. **Define – Macro Shock**

A physiological response to a current applied to the surface of the body that produces unwanted stimulation like tissue injury or muscle contractions is called as macro shock.

5. **Define - Let-go current.**

Let – go current is the minimum current to produce muscular contraction. For men—about 16mA For Women—about 10.5 mA

6. **What is the purpose of using resuscitation unit.**

Resuscitation unit is generally used in intensive care unit (ICU). In modern hospitals the resuscitation units are in the form of a mobile trolley.

7. **List the applications of Endoscope**

Endoscopes are used in hospitals for examination, treatment of disease and surgery.

8. **Define Thermograph.**

It is the process of recording true thermal images of the surfaces of object under study. It diagnostic aid for breast cancer, pneumatic disease or joint disease

9. **Analyze the principle of cryogenic technique and list its applications**
It is the study and use of materials at extremely low temperature. Applications are cryobiology, cryosurgery, cryonics, cryoelectronics, cryotronics.

10. **Give the advantages of cryogenic surgery.**
A low temperature scalpel or probe can be used to freeze unhealthy tissue. Freezing the tissue rather than cutting it produces less bleeding. Successful in removing tonsils, warts, cataracts and tumors.

11. **Recommend the potential benefits of telemedicine.**
Healthcare Cost Savings, Remote analysis and monitoring services and electronic data storage significantly reduce healthcare service costs, saving money for patients, and insurance companies

12. **Infer the term "Telemedicine".**
Telemedicine is the application of telecommunications and computer technology to deliver health care from one location to another.

13. **Tabulate the merits and demerits of various medical thermographic techniques.**
It is the diagnostic aid for breast cancer, pneumatic disease or joint diseases

14. **Explain an endoscope**
Endoscopes are used in hospitals for examination, treatment of disease and surgery.

PART-B

1. **What are the uses of endoscopes in medicine? Describe any one of the therapeutic instrument using an endoscope. (7)**
Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No:

2. **Explain with block diagram the infrared thermograph technique and its merits and demerits.(6)**
Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 252

3. **Draw the basic setup of a medical thermograph unit and define the function of each unit in it. Name the applications of thermograph**
Refer Biomedical Instrumentation and measurements by "Leslie Cromwell" page No: 252

4. **A bloodless surgery is being planned using laser. Invent which type of laser is suitable to achieve this. Discuss on the process involve in the laser production and application.**
Refer Medical Electronics by "R L Reka" page No:5.5

5. **Describe about the evolution and technologies involved in telemedicine. Discuss the application areas of telemedicine**
Refer Medical Electronics by "R L Reka" by "Leslie Cromwell" page No:5.10

6. **Define the laser principle and identify the different laser interactions on our body.**
Refer Medical Electronics by "R L Reka" by "Leslie Cromwell" page No:5.5

7. **Write short notes on He-Ne laser and the general applications of laser in medicine**
Refer Medical Electronics by "R L Reka" "Leslie Cromwell" page No: 5.5

8. **Explain the different types of Lasers used in medicine.**
   Refer Medical Electronics by "R L Reka" page No: 5.5

9. **Give a brief detail note about Endoscopy unit.**
   Refer Medical Electronics by "R L Reka" page No: 5.2

10. **Explain with block diagram the infrared thermograph technique and its merits and demerits.**
    Refer Medical Electronics by "R L Reka" page No: 5.4

11. **Give an account on biological effects of radiation exposure & safe dose equivalent limits.**
    Refer Medical Electronics by "R L Reka" page No: 5.5

12. **Justify the need for each of the essential components in an endoscope & its application**
    Refer Medical Electronics by "R L Reka" page No: 5.1

13. **Summarize a note on cryogenic surgery.**
    Refer Medical Electronics by "R L Reka" page No: 5.7

ANNA UNIVERSITY PREVIOUS YEAR QUESTION PAPERS

Reg. No. :

Question Paper Code : 60409

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Sixth/Seventh Semester

Electronics and Communication Engineering

EC 2021/EC 601/EC 1001/10144 ECE 11 — MEDICAL ELECTRONICS

(Regulations 2008/2010)

(Common to PTEC 2021/10144 ECE 11 – Medical Electronics for BE. (Part-Time) Sixth/Seventh Semester – ECE – Regulations 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is bioelectric potential?
2. Define latency in EMG.
3. Which flow meters are used to measure pulsatile flow of blood?
4. Draw lung volume diagram.
5. List the two types of multiplexing involved in multichannel wireless telemetry.
6. What is meant by a demand pacemaker?
7. What is meant by ionising radiation?
8. What is a betatron? What is its application?
9. List the parts of endoscope unit.
10. What is Macro shock?

PART B — (5 × 16 = 80 marks)

11. (a) Explain the different lead systems used in the measurement of ECE waveform and also explain the working of an ECG recorder.

Or

(b) With a neat diagram, explain the working of EMG systems and also give its typical waveforms that represent its signal characteristics.

12. (a) (i) With sketch explain how the PCO_2 of blood is measured. (8)

(ii) Describe the working principle of an Electrophoresis apparatus. Give its applications. (8)

Or

(b) (i) Explain electromagnetic blood flow meter. (8)

(ii) Explain ausculatory blood pressure measurement. (8)

13. (a) (i) With neat diagram, describe the function of ventricular inhibited pacemaker. (8)

(ii) What is a radiopill? Explain with the help of an example. (8)

Or

(b) How is atrial fibrillation arrested? Explain with the help of relevant diagram of the setup.

14. (a) With the aid of suitable diagrams explain the construction and operation of LINAC used in radiotherapy. Also, mention the safety precautions to be followed in radiotherapy. (16)

Or

(b) With suitable illustration explain the functional aspects of X-Ray machine Discuss the role of each part of the circuit. (16)

15. (a) Write brief notes on :

(i) Thermograph (8)

(ii) Endoscopy unit. (8)

Or

(b) Explain the following :

(i) Surgical diathermy (8)

(ii) Argon Laser and its medical application. (8)

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Reg. No. : [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Question Paper Code : 71701

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Sixth Semester

Electronics and Communication Engineering

EC 6001 — MEDICAL ELECTRONICS

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define absolute and relative refractory period.

2. Mention the cause of first and second heart sounds.

3. What is blood pressure? State the normal values of blood pressure.

4. State the different types of test performed using auto analyser.

5. Differentiate internal and external defibrillator.

6. What is dialyasate? Mention it Composition.

7. Define desiccation and haemostasis.

8. List the applications of biotelemetry.

9. What makes thermograph useful?

10. List the properties of LASER beam.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the international standard 12 lead system used to record ECG. (10)

(ii) List and discuss the important characteristics of bioamplifier. (6)

Or

(b) (i) Discuss in detail about the 10 - 20 lead system. (10)

(ii) Describe the typical EMG waveform and its characteristics. (6)

12. (a) (i) Describe the measurement of PO_2. (8)

(ii) Explain the block diagram and working of colorimeter. (8)

Or

(b) (i) Define the term "Cardiac Output". How is cardiac Output measured by dye dilution technique? Explain. (8)

(ii) Describe the working of principal of electromagnetic blood flow meter. (8)

13. (a) (i) With a neat diagram explain the block diagram of DC defibrillator. (8)

(ii) Describe the working of atrial synchronous pacemaker. (8)

Or

(b) Explain in detail the different types of oxygenators and pumps used in heart lung machine. (16)

14. (a) (i) Explain the simplified circuit diagram of a microwave diathermy machine. (10)

(ii) Discuss the different methods of applying electrodes in shortwave diathermy treatment. (6)

Or

(b) (i) Describe the single channel ECG telemetry system. (8)

(ii) Briefly discuss about micro and macro shocks. (8)

15. (a) (i) What is endoscope? Explain the different types of operations performed using endoscopy. (10)

(ii) Describe the working principle of thermograph. (6)

Or

(b) (i) Explain the different types of LASER. (10)

(ii) Write short notes on cryogenic applications. (6)

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