EC8691 MICROPROCESSORAND MICROCONTROLLER LT PC
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UNITI THE 8086 MICROPROCESSOR 9

Introduction to 8086–Microprocessor architecture–Addressing modes-Instruction set and assembler directives– Assembly language programming–Modular Programming-Linking and Relocation-Stacks-Procedures–Macros–Interrupts and interrupt service routines– Byte and String Manipulation.

UNITII 8086SYSTEMBUS STRUCTURE 9

8086 signals – Basic configurations – System bus timing –System design using 8086– IO programming– Introduction to Multiprogramming–System Bus Structure-Multiprocessor configurations– Coprocessor, Closely coupled and loosely Coupled configurations– Introduction to advanced processors.

UNITIII I/O INTERFACING 9

Memory Interfacing and I/Ointerfacing-Parallelcommunicationinterface–Serialcommunication interface–D/A and A/D Interface-Timer–Keyboard/displaycontroller–Interruptcontroller–DMA controller–ProgrammingandapplicationsCasestudies:TrafficLightcontrol,LEDdisplay ,LCD display, Keyboard display interface and Alarm Controller.

UNITIV MICROCONTROLLER 9

Architectureof8051–Special Function Registers (SFRs)-I/O Pins Ports and Circuits- Instruction set -Addressing modes-Assembly language programming.

UNITVINTERFACINGMICROCONTROLLER 9

Programming 8051 Timers - Serial Port Programming-Interrupts Programming–LCD & Keyboard Interfacing-ADC, DAC & Sensor Inter facing-External Memory Interface-Stepper Motor and Waveform generation.

OUTCOMES:

Atthe end of the course, the studentshouldbe ableto:

- Design andimplementprogramson8086microprocessor.
- DesignI/O circuits.
- Design MemoryInterfacingcircuits.
- Design andimplement8051 microcontrollerbased systems.

TOTAL:45PERIOD

TEXTBOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programmingand Design",SecondEdition,Prentice Hall ofIndia,2007.
2. MohamedAliMazidi,JaniceGillispieMazidi,RolinMcKinlay,"The8051Microcontrollerand EmbeddedSystems:UsingAssemblyandC",SecondEdition,Pearsoneducation,2011.

REFERENCE:

1. DoughlasV.Hall,"MicroprocessorsandInterfacing,ProgrammingandHardware",TMH,2012

UNIT –I 8086 MICROPROCESSOR
PART A

1. What is the use of MN/MX signals in 8086?

It is used to operate the microprocessor in two operating modes i.e. maximum and minimum mode. The minimum mode is used for small systems with a single processor and maximum mode is for medium size to large systems, which include two or more processors

2. How many data lines and address lines are available in 8086?

Address lines= 20 bit address bus
Data lines= 16 bit data bus

3. What is the use of Instruction Queue in 8086 microprocessor?

The queue operates on the principle of first in first out(FIFO). So that the execution unit gets the instruction for execution in the order they fetched .Feature of fetching the next instruction while the current instruction is executing is called pipelining which will reduce the execution time.

4. What is pipelining? [May 2007]

In 8086, to speed up the execution of program, the instructions fetching and execution of instructions are overlapped each other. This technique is known as pipelining

5. Write the size of physical memory and virtual memory of 8086 microprocessor.

Physical addresses are formed when the left shifted segment base address is added to the offset address. The combination of segment register base addresses and offset address is the logical address in memory.

Size of physical memory=2^{20}=1MB Size of virtual memory=2^{16}=64 KB

6. How the physical address for fetching the next instruction to be executed, is obtained in 8086?[Dec 2013]

The physical address is obtained by appending four zeros to the content present in CS register and then adding the
Content of IP register with the above value.
For example, assuming the content of
CS = 1200 H
IP = 0345 H
CS= 0001 0010 0000 0000 0000
0000 0011 0100 0101

0001 0010 0011 0100 0101 – Physical address=12345 H

7. If the execution unit generates effective address of 43A2 H and the DS register contains 4000 H. What will be the physical address generated by the BIU? What is the Maximum Size of the data segment?

Effective address = 43A2 H

Physical address = 40000H

443A2 H
Maximum size of DS = 2^{16} = 64 KB

8. What are the difference between 8085 and 8086?

S.No	8085	8086
1.	8 bit microprocessor	16 bit microprocessor
2.	2^{16} memory locations	2^{10} memory locations
3.	Sequential facility	Pipelined architecture available
4.	Low speed	High speed

9. What is operation carried out when 8086 executes the instruction MOVSB ?
MOVSB
Move String Byte
[[DI]] [SI]]
Move 8 bit data from memory location addressed by SI segment in DS location to addressed by DI in segment ES.
If DF (Direction Flag) = 0, SI is incremented by
1. = 1, SI is decremented
by 1

10. What is recursive procedures?
A recursive procedure is a procedure, which calls itself. Recursive procedures are used to work with complex data structures called trees. If the procedure is called with N=3, then the N is decremented by 1 after each procedure CALL and the procedure is called until N=0.

11. What are Macros?
Macro is a group of instruction. The macro assembler generates the code in the program each time where the macro is called. Macros are defined by MACRO & ENDM directives.
Creating macro is similar to creating new opcodes that can be used in the program

```
INIT MACRO
MOV AX, data
MOV DS
MOV ES, AX
ENDM
```

12. What is interrupt service routine? [May 2009]
Interrupt means to break the sequence of operation. While the CPU is executing a program an interrupt breaks the normal sequence of execution of instructions & diverts its execution to some other program. This program to which the control is transferred is called the interrupt service routine.

13. Compare Procedure & Macro. [Dec 2010, May 2011]

Accessed by CALL & RET instruction Accessed during assembly with name given during program execution to macro when defined Machine code for instruction is put only once in the memory Machine code is generated for instruction each time when macro is called With procedures less memory is required With macro more memory is required Parameters can be passed in registers, memory locations or stack Parameters passed as part of statement which calls macro.

14. List the various addressing modes present in 8086. [Apr/May 2015]

There are 12 addressing modes present in 8086. They are,
Register addressing mode, Immediate addressing mode
Direct addressing modes, Register indirect addressing modes
Based addressing modes, Indexed addressing modes
Based Indexed addressing modes, String addressing modes
Direct addressing mode, Indirect addressing mode
Relative addressing mode, Implied addressing mode

15. Name any four flags of 8086. [May 2009]

Auxiliary carry flag (AF), Carry flag (CF), Direction flag (DF), Interrupt flag(IF), Overflow flag(OF), Parity flag)PF), Sign flag (SF), Trap flag (TF), Zero flag(ZF).

16. List the advantages of using segment registers in 8086.[May 2008]

- It allows the memory addressing capacity to be 1MB even though the address associated with individual instruction is only 16-bit.
- It facilitates use of separate memory areas for program, data and stack.
- It allows the program to be relocated which is very useful in multiprogramming

17. What are assembler directives? Give an example?[May 2011, May 2013]

There are some instructions in the assembly language program which are not a part of processor interrupt set. These are reffered to as pseudo operation or as assembler directives. Eg. DB, DW, ASSUME.

18. What is assembler?

The assembler translates the assembly language program text which is given as input to the assembler to their binary equivalents known as object code. The time required to translate the assembly code to object code is called access time. The assembler checks for syntax errors & displays them before giving the object code

19. Define BIOS.

The IBM PC has in its ROM a collection of routines, each of which performs some specific function such as reading a character from keyboard, writing character to CRT. This collection of routines is referred to as Basic Input Output System or BIOS

20. Write an 8086 assembly language program to multiply two 16 bit numbers.

```
MOV AX, [2000]
MUL [2002]
```

```
MOV [2100], DX
MOV [2102], AX
HLT
```

21. Write about the different types of interrupts supported in 8086?[Apr/May 2015]

- Divide by zero interrupt
- Single step interrupt
- Non maskable interrupt
- Break point interrupt
- Overflow interrupt
- Software interrupt (Type 0 to Type 255)
- Maskable interrupt

PART-B QUESTIONS

1. **(i) Explain the internal hardware architecture of 8086 microprocessor with neat diagram?**
   (ii) Write short note about assembler directives?
2. **Explain the various addressing modes of 8086 microprocessor with examples?**
3. **(i) Explain Data transfer, arithmetic and branch instructions ?**
   (ii)Write an 8086 ALP to find the sum of numbers in the array of 10 elements?
4. **Explain modular programming in detail?**
5. **Write a note about stack, procedures and macros?**
6. **Define interrupt and their two classes? Write in detail about interrupt service routine?**
7. **Explain byte and string manipulation with examples?**
8. **Write in detail about instruction formats and instruction execution timing?**
9. **Write an ALP to find the largest number and smallest number in the array?**
10. **Write a short note about**
    (i)Loop, NOP and HLT instructions
    (ii) Flag manipulation, logical and shift& rotate instructions?

UNIT-II 8086 SYSTEM BUS ARCHITECTURE
PART A

1. What are the differences between Memory mapped I/O and I/O mapped I/O in 8086?

S.No	Memory mapped I/O	I/O mapped I/O
1.	It is related as a memory location	It is not related as a memory location
2.	Microprocessor can access I/O devices By memory instruction like MOV AX, [BX], No special instructions are needed	It require special instruction to access I/O devices like IN ,OUT
3.	8086 can access **1**M Byte memory locations or I/O ports	8086 can access 64 K Byte memory locations
4.	It requires 20 address lines	It requires 16 address lines
5.	MEMR, MEMW can be used to I/O devices	IOR, IOW signals are used
6.	It is suitable for small system	It is suitable for large system

2.What are the schemes for establishing priority in order to resolve bus arbitration problem?

There are three basic bus access control and arbitration schemes

1. Daisy Chaining
2. Independent Request
3. Polling

3. What is the function of the BHE signal in 8086?

BHE signal means Bus High Enable signal. The BHE signal is made low when there is some read or write operation is carried out. ie .When ever the data bus of the system is busy i.e. whenever there is some data transfer then the BHE signal is made low.

4. What is multiprogramming?

If more than one process is carried out at the same time, then it is know as multiprogramming. Another definition is the interleaving of CPU and I/O operations among several programs is called multiprogramming.

5. Differentiate between absolute and linear select decoding.

S.No	Absolute decoding	Linear decoding
1	All higher address lines are defined to select the memory or I/O device.	Few higher address lines are decoded to select the memory or I/O device
2	More h/w is required to design decoding logic	Hardware required to design decoding logic is less
3	Higher cost for decoding circuit	Less cost for decoding circuit
4	No multiple address	Has a disadvantage of multiple addressing
5	Used in large systems	Used in small systems

6. How do 8086 interrupts occur?

An 8086 interrupt can come from any of the following three sources

• External signals

• Special instructions in the program

• Condition produced by instruction

7. Explain the BHE and LOCK signals of 8085

BHE- Bus high signal is used to indicate the transfer of data over the higher order (D15-D8)bus

LOCk-Lock the bus from DMA or other master

8. What do you mean by numeric processor?

8087 is the numeric processor or co-processor. It adds arithmetic, exponential and logarithmic instruction to 8086/8088 set for all data types.

9. What are the advantages of loosely coupled configuration in a multiprocessor

- Each processor may have a local bus to access local memory or I/O devices.
- More flexible
- Better system throughput by having more than one processor
- If any fault occurs in module, that fault module can be detected and replaced. So the breakdown of the entire system is avoidable.

10.What is the function of TF, DF ,IF in 8086?

TF: It is used for single stepping through a program. In the mode, the 8086 generates an internal interrupt after execution of each instruction.

DF: It is used to set direction in string operation.

IF: It is used to receive external maskable interrupts through INTR pin. Clearing IF, disable these interrupts

11.What are the two modes of operations present in 8086?

i. Minimum mode (or) Uniprocessor system

ii. Maximum mode (or) Multiprocessor system

12.What is multiprogramming?

If more than one process is carried out at the same time, then it is know as multiprogramming. Another definition is the interleaving of CPU and I/O operations among several programs is called multiprogramming.

13.State the functional units available in 8086?

BIU- Bus Interface Unit

EU- Execution Unit

14. What are the functional parts of control unit in 8087?

Control word register

Status word register

Data buffer
Shared operand queue

15. Name the data type of 8087?

Binary register-16bits, 32 bits, 64 bits
Packed decimal number-80 bits
Floating point/Real number-32bits, 64 bits, 80 bits

16. What is the need of BUSY bit in status word of 8087?

It gives the information about numerical execution unit (NEU)
If B_{15}=1, the NEU is busy with execution
0, NEU is free

17. Mention the feature of 8087.

- 8087 is a high performance data co-processor
- It supports 16, 32,64bit register, 32,64,80 bits floating point and 16 digit BCD data types.
- It has multi –bus system compatible interface
- It is designed to specially work with 8086 and 8088 processor
- It adds arithmetic, trigonometric, exponential and logarithmic instruction to 8086/8088

18. What is the maximum memory size that can be addressed by 8086?

In 8086, an memory location is addressed by 20 bit address and the address bus is 20 bit address and the address bus is 20 bits. So it can address up to one mega byte (2^20) of memory space.

19. What are the functions of bus interface unit (BIU) in 8086?

(a) Fetch instructions from memory.
(b) Fetch data from memory and I/O ports.
(c) Write data to memory and I/O ports.
(d) To communicate with outside world.
(e) Provide external bus operations and bus control signals.

20. What are the different types of methods used for data transmission? [May/June 2015]

The data transmission between two points involves unidirectional or bi-directional transmission of meaningful digital data through a medium. There are basically there modes of data transmission

(a) Simplex
(b) Duplex
(c) Half Duplex

21. Define bus. Why bus request and cycle stealing are required?[Nov/Dec 2014]

- Microprocessor needs to communicate with Input devices to get data,it needs to communicate with memory to process data according to instructions written in memory and finally it needs to communicate with output devices to display the output on O/P

devices. To communicate with external world, Microprocessor make use of buses. There are different types of buses used in Microprocessor:

- DMA transfers can either occur one byte at a time or all at once in burst mode. If they occur a byte at a time, this can allow the CPU to access memory on alternate bus cycles – this is called cycle stealing

22. What are the advantages of a loosely coupled configuration in a multiprocessor system

- Better throughput
- Expanded in modular form
- Failure of one module does not affect other module

23. Explain the function of BHE and ALE

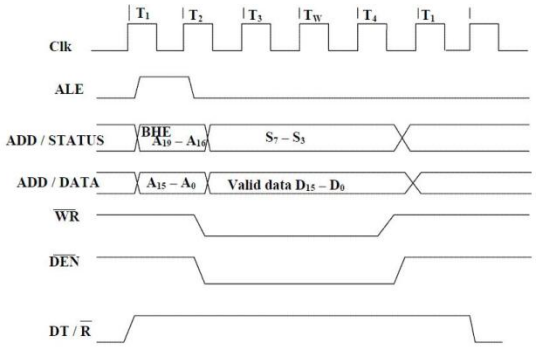
Address Latch Enable:

When high, multiplexed address/data buscontains address information

Bus High Enable/S7

Enables most significant data bits

24. Draw the read cycle timing diagram for minimum mode configuration. [Nov/Dec 2014]



Write Cycle Timing Diagram for Minimum Mode

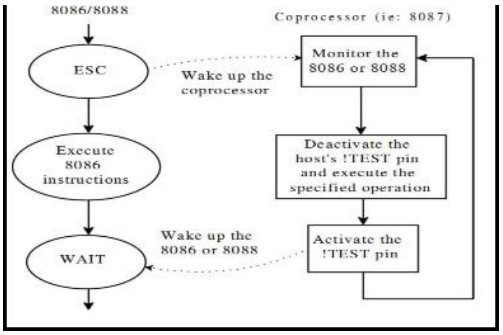
25. What is the need for multiprocessor configuration?

- Limited data width
- DMA processor can help CPU

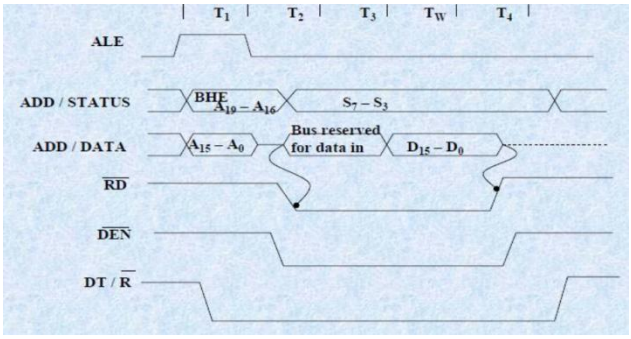
26. What is the purpose of CLK signal in an 8086 system.

To provide timing information, To synchronize device

27. Schematically show the synchronization is made between 8086 and its co-processor.



28. **Draw the read cycle timing diagram for minimum mode**?



Part-B

1. **Explain Minimum mode and maximum mode of operation in 8086 in detail.**
2. **Explain in detail about the system bus timing of 8086/8088.**
3. **Write notes on the following**
   - **(i) Programmed I/O**
   - **(ii) Interrupt I/O**
4. **Explain in detail about block transfers and DMA.**
5. **Explain in detail about closely coupled configurations.**
6. **Explain loosely coupled configurations in detail.**
7. **Explain the following in detail**
   - **(i) Process Management &iRMX86**
   - **(ii) Memory Management**
   - **(iii) Virtual Memory**
8. **Explain Numeric data Processor in detail.**
9. **Explain in detail about I/O Processor.**

i. **Explain the following**

Multiprocessor system(4)

Coprocessor(4)

Multiprogramming(4)
Semaphore(4)

UNIT-III I/O INTERFACING
PART A

1. What are the basic modes of operation of 8255? [May 2011]

There are two basic modes of operation of 8255, viz.
1. I/O mode.
2. BSR mode.

In I/O mode, the 8255 ports work as programmable I/O ports, while In BSR mode only port C (PC0-PC7) can be used to set or reset its individual port bits.

2. What is meant by DMA data transfer?

DMA stands for Direct memory Access. In order to transfer bulk amount of data between memory and I/O device without the involvement of CPU.

3. What is key bouncing? [June 2006]

Key bouncing is the mechanical vibratory action of the contact making and breaking. When keys are pressed in keyboard. Key bounce can be confused as the rapid pressing a key.

4. Name the modes of DMA operation.

Slave mode operation
Master mode operation

5. List the use of USART.

USART provide serial communication
Used in GPS navigation system
Mobile application
Industrial and control application

6. What is the count value needed to program the 8254 to generate a delay of 0.5 ms?

Clock frequency of 8254= 2.6 MHZ
Time required for 1 T sate = $1/ 2.6X10^{6}$=0.385 µsec
Number of T states required for 0.5 ms= $0.5X10^{-3}/ 0.385X10^{-6}$= 1300

7.What is an USART?

USART stands for universal synchronous/Asynchronous Receiver/Transmitter. It is a programmable communication interface that can communicate by using either synchronous or asynchronous serial data.

8.Define HRQ.

The hold request output requests the access of the system bus. In non- cascaded 8257 systems, this is connected with HOLD pin of CPU. In cascade mode, this pin of a slave is connected with a DRQ input line of the master 8257, while that of the master is connected with

HOLD input of the CPU

9.State the status word format for 8254.

OUT
NULL
COUNT
RW1 RW0 M2 M1 M0 BCD

10.Define Baud rate?[Dec 2012]

The rate at which the bits are transmitted is called Baud rate. The standard baud rates are 75, 110,150, 300, 600, 1100, 2400.

11.What is the purpose for the 8255 PPI?[May 2009]

The 8255A is a widely used, programmable, parallel I/O device. It can be programmed to transfer data under various conditions, from simple I/O to interrupt I/O.

12. What is the use of stepper motor?

A stepper motor is a device used to obtain an accurate position control of rotating shafts. A stepper motor employs rotation of its shaft in terms of steps, rather than continuous rotation as in case of AC or DC motor.

13. What are TXD and RXD?

TXD- Transmitter Data Output is a output pin carries serial stream of the transmitted data bits along with other information like start bit, stop bits and priority bit

RXD- Receive Data Input This input pin of 8251A receives a composite stream of the data to be received by 8251A.

14. List the major components of the keyboard/Display interface.

a. Keyboard section
b. Scan section
c. Display section
d. CPU interface section

15.What is interfacing?

An interface is a shared boundary between the devices which involves sharing information. Interfacing is the process of making two different systems communicate with each other.

16. What is need for D/A converter?

The microprocessor can produce only digital signals. Analog signals are needed for controlling certain analog devices in many applications. The digital –to analog converters used to convert digital signal into analog signal

17. What are the primary features of 8259?

It manages 8 interrupt requests (IR_0 to $IR_{7)}$
8259 can solve eight level of interrupt priority in many models

It is designed to operate only with 8bit processor, 8259A is designed to operate 8 bit as well as 16 bit processors.

18. What is stack pointer and write the stack level of 8051

The b-bit stack pointer register is used by 8051 to hold on internal RAM address that is called the top of the stack. The address held in last byte of the data was stored by stack operation. SP is set to 07H when 8051 is reset and can be changed by any internal RAM address by the programmer.

19. What are the control signals are used in A/D converter?

Control signals used in A/D converter

$\overline{RD}$, $\overline{WR}$, $\overline{CS}$, $\overline{INTR}$

20.What is the use of DAA instruction in 8051?

DAA –Decimal adjust accumulator after addition

This instruction is used after addition of BCD numbers to convert the result back to BCD. It adds 6 to the lower 4 bits of A if it is greater than 9 or AC =1. It also adds 6 to the upper 4 bits of A if it is greater than 9 or if Cy =1.

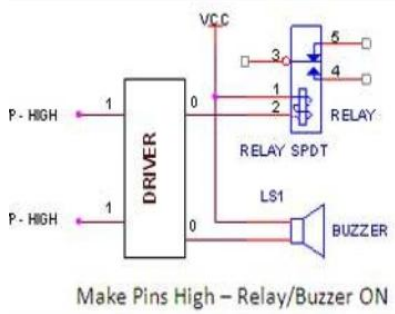
21. Give the various modes and applications of 8254 timer?

- Mode 0: An events counter enabled with G.
- Mode 2: Counter generates a series of pulses 1 clock pulse wide
- Mode 1: One-shot mode.
- Mode 3: Generates a continuous square-wave with G set to 1
- Mode 5: Hardware triggered one-shot. G controls similar to Mode 1.

22. Define half duplex and full duplex.

In a half-duplex system, there are still two clearly defined paths/channels, and each party can communicate with the other but not simultaneously; the communication is one direction at a time. In a full duplex system, both parties can communicate with each other simultaneously.

23. Draw the block diagram of alarm controller with 8086 as processor?



24. What frequency transmit clock (TxC) is required by an 8251 in order for it to transmit data at 4800 baud with a baud rate factor of 16?

Frequency =4800/16=30GHz

PART-B

1. **Draw and explain the block diagram of 8254 programmable interval timer. Also explain the various modes of operation.**
2. **Explain 8279 keyboard /display controller with neat block diagram.**
3. **(i)Explain how to interface: (i) ADC and (ii) DAC**
   (ii) Compare serial and parallel interface?
4. **With neat block diagram explain the 8251 and its operating modes.**
5. **Draw the block diagram of I/O interface &explain in detail.**
6. **Explain in detail about DMA controller.**
7. **Explain the format of I/O mode set control and BSR control word of programmable peripheral interface. Explain in detail the operating modes of PPI?**
8. **Draw and explain the block diagram of traffic light control system.**
9. **Write short notes on LED display, LCD display,Keyboard display interface.**
10. **Draw and explain the block diagram of alarm controller.**

UNIT – IV MICROCONTROLLER
PART A

1. What is Microcontroller?

Microcontroller incorporates all the features that are found in microprocessor with the added features of in-built ROM, RAM, Parallel I/O, Serial I/O, counters and clock circuit to make a micro computer system on its own.

2. What is the advantage of microcontroller over microprocessor?

12. The overall system cost is low , as the peripherals are integrated in a single chip.
13. The size is very small
14. The system is easy to troubleshoot and maintain.
15. If required additional RAM , ROM and I/O ports may be interfaced.
16. The system is more reliable.

3. What is the function of IP register in 8051? [May 2010]

The IP register is used to set high priority to one or more interrupt in 8051

-	-	-	PS	PT1	PX1	PT0	PX0

Setting a bit to 1 makes the corresponding interrupt to have high priority and setting a bit to 0 makes the corresponding interrupt to have low priority.

4. What is the importance of special function registers(SPF) in 8051?

17.

The 8051 operations that do not use the internal 128 byte RAM address from 00 H to 7F H are done by a group of special internal registers called SPFs(Special Function Registers) Which have address between 80 H and FF H.

5.Define baud rate.[may 2009]

18.

Baud rate is used to indicate the rate at which data is being transferred . Baud rate = 1/Time for a bit cell.

6.What is the function of DPTR register?

The data pointer register (DPTR) is the 16 bit address register that can be used to fetch any 8 bit data from the data memory space. When it is not being used for this purpose, it can be used as two eight bit registers , DPH and DPL.

7.**What is the job of the TMOD register?**

TMOD (timer mode) register is used to set the various timer operation modes . TMOD is dedicated to the two timers (Timer0 and Timer1) and can be considered to be two duplicate 4 bit registers, each of which controls the action of one of the timers

8. What are the difference between a microprocessor and microcontroller?[May 2014]

S.NO	MICROPROCESSOR	MICROCONTROLLER
1.	It has one or two types of bit handling Instructions	It has many bit handling instructions.
2.	No SFRs are available.	SFRs are available.
3.	ROM ,RAM ,Parallel I/O , Serial I/O , Counters and a clock circuit are not available.	ROM ,RAM ,Parallel I/O , Serial I/O , Counters and a clock circuit are available.
4.	Microprocessor based system requires more	Microprocessor based system requires less
	hardware.	hardware.
5.	Microprocessor based system is more flexible for design.	Microprocessor based system is comparatively less flexible for design.

9. What are the register banks in 8051 microcontroller?

34 general purpose or working registers in which A and B hold results of math and logical operations. The other 32 are arranged as part of the internal RAM in 4 banks : bank 0 , bank 1, bank 2 and bank 3, each of eight registers.

10. **How does the status of EA pin affect the access to internal and external program memory?**

EA- Enable Interrupt bit. Cleared to 0 by program to disable all interrupts , set to 1 to permit individual interrupts to be enabled by their enabled bits . It is set to access data from external memory or else it is grounded for internal memory operations

11. What is the difference between timer and counter operation in 8051?

The timer counts the internal clock pulses whose frequency is $1/12^{th}$ of oscillator frequency .

The counter counts the internal clock pulses which are given through T0 pin (for counter 0) and T1 pin (for counter 1) of 8051.

12. Explain the instruction : SWAP

SWAP instruction works only on the accumulator (SWAP A) . It swaps the lower nibble and higher nibble .The lower 4 bits are put into the higher 4 bits and the higher 4 bits are put into the lower 4 bits.

E.g.- SWAP A

	ACC	
Before	1111 0000	**execution** :
After	0000 1111	**execution** :

13.What is keydebouncing?

When a key press is found, the microcontroller waits for at least 10ms before it accepts the key as input. It is called as key debouncing.

14.List the applications of microcontroller.

Motor speed control
Industrial control
Peripheral devices
Automobile applications
Home applications

15. Mention the various addressing modes of 8051.

Immediate addressing mode
Register addressing mode
Direct addressing mode
Register indirect addressing mode
Indexed addressing mode

16.What is nested interrupts?

The 8051 is executing an ISR for servicing an interrupt and another interrupt occurs. If the new coming interrupt is high priority then only it can interrupt the previously occurred low priority interrupt. These are called nested interrupts.

17.What are the contents of the accumulator after the execution of the following program segments?

MOV A, #3CH
MOV R4, #66H
ANL A, R4
A 3C
R4 66
A 24

18.Write a program to load accumulator A, DPH and DPL with 30H.

MOV A, #30
MOV DPH, A
MOV DPL, A

19. **Mention the various instruction set of 8051.**

Data transfer group

Arithmetic group
Logical group
Boolean manipulation
Program branching

20. Write in detail about the RET instruction of 8051.

This instruction is used to return from a subroutine entered by CALL instructions. The two bytes of stack are popped into PC and program execution continues at new address. After Popping the stack pointer is decremented by two.

21. What is the jump range?[Nov 2013]

The short jump allows jumps to memory location with +127 and -127 bytes from the memory location .Long jumps anywhere in 64K bytes of memory.

22. How do you select the register bank in 8051 microcontroller?

The value presented by RS1 &RS0 bits select the corresponding register bank
00-reg.bank0,01- reg.bank1,10- reg.bank2,11- reg.bank3

PART-B

1. **Explain the architecture of 8051 with its diagram.**
2. **Explain the I/O pins ports and circuit details of 8051 with its diagram.**
3. **Write an 8051ALP to create a square wave 66%duty cycle on bit3 of port 1.**
4. **With example explain the arithmetic and logic instruction of 8051 microcontroller.**
5. **With example explain the different instruction set of 8051 microcontroller.**
6. **Write a program based on 8051 instruction set to pack array of unpacked BCD digits.**
7. **Explain the different addressing modes of 8051**
8. **Write a program to bring in data in serial form and send it out in parallel form using 8051**
9. **Explain the data types and assembler directives of 8051**
10. **Explain about the register banks and special function register of 8051 in detail**

UNIT- V INTERFACING MICROCONTROLLER
PART A

1. List the feature of keyboard and display interface.

It has built in hardware to provide key bounce
It provides 8 byte FIFO RAM to store keycodes
It provides multiplexed display interface with blanking and inhibit options
It has two key depression modes (2 key lock out, N key roll over mode)
8279 has 2 output modes for display interface(left entry, Right entry)

2. Name any method available for error correction during serial communication.

Parity bits

Check sum
Cyclic redundancy check
Hamming code with 4 bit parity to encoder

3. What is meant by time multiplexed LED display?

At a time only one LED displays data while other LED remain in off condition, But within few seconds, next LED is turned on while all others are in OFF condition. This is repeated continuously so that all LEDs seem to display data simultaneously.

4. What is difference between two key lock out and N-key rollover modes in 8279?

Two key lockout- If two keys are pressed within the debounce cycle. It is simultaneous Depression, key will be recognized until one of the key is released. The final key is released will be recognized and entered.

N-Key rollover mode- Each key depression is treated independently. If simultaneous depression occurs, then the keys are recognized and entered according to the order the keyboard scan found them

5. What is need for A/D converter?

Analog signals are needed for controlling certain analog devices in many applications. The analog –to digital converters are used to convert the analog to digital signals.

6.How does 8051 differentiate between the external and internal program memory?

S.NO	EXTERNAL PROGRAM MEMORY	INTERNAL PROGRAM MEMORY
1	EA pin is high	EA pin is grounded
2.	PSEN signal is activated	PSEN is grounded
3.	8051 can address up to 64 KB of External program memory	4KB of internal program memory is available
4.	Accessible by only direct and indirect addressing modes	Accessible by all addressing modes

7.What are the two memory address pointers in 8051 microcontroller?

Program counter and Data Pointer are the two memory address pointers in 8051. The program instruction bytesare fetched from the locations in memory that are addressed by the PC. The DPTR register is made up of two 8 bit registers named DPH and DPL, which are used to furnish memory address for internal and external code access and external data access

8. Give the PSW setting for register bank 2 as default bank in 8051 microcontroller.

7	6	5	4	3	2	1	0
CY	AC	FO	RS1	RS0	OV	-	P

By setting RS1= 1 and RS0 = 0, register bank 2 can be selected.

9. Give steps to program 8051 for serial data transfer.

The 8051 has a serial data communication circuit that uses register SBUF to hold data. Register SCON controls data communication, register PCON controls data rates, and pins RXD (P3.0) and TXD (P3.1) connect to serial data network

10. What is the significant of GATE in TMOD control register?

It is OR gate enable bit which controls RUN/STOP of timer 1/0.

Timer/ Counter is enabled while TR 1/0 in TCON is set and signal on external interrupt INT1/0 pin is high. Cleared to 0 by program to enable timer to run , if bit TR1/0 in TCON is set.

11.How does the status of EA pin affect the access to internal and external program memory?

EA- Enable Interrupt bit. Cleared to 0 by program to disable all interrupts , set to 1 to permit individual interrupts to be enabled by their enabled bits . It is set to access data from external memory or else it is grounded for internal memory operations.

12.What happens in power down mode of 8051 microcontroller?

The memory locations of power down RAM can be maintained through a separate small battery backup supply so that the content of these RAM can be preserved during power failure conditions.

13. Mention the various timer modes of 8051.

0=13 bit timer
1=16 bit timer
2=8 bit auto reloads
3=split timer mode

14. Write an ALP program for function to generate 100µs delay using timer 0.

```
Delay :  MOV TMOD, # 01H; initialize TMOD
         MOV TL0,#47H ; initialize TL0
         MOV TL0, #FFH; initialize TH0
         SETB TR0; start timer
         Wait: JNB TF0, Wait; wait for TF0
         CLR TR0; stop timer
         CLR TF0; clear TF0
         RET
```

15. What is the use of timer and counter in 8051?

- Interval Timing
  - Periodic event timing
  - Time base for measurements
- Event Counting
- Baud Rate Generation

16. Write a program for the 8051 to transfer letter "A" serially at 4800 baud, continuously.

```
        MOV TMOD, #20H
        MOV  TH1, #-6
        MOV  SCON, #50H
        SETB  TR1
AGAIN:  MOV   SBUF, #"A"
HERE:   JNB    T1, HERE
        CLR    T1
        SJMP   AGAIN
```

17. Mention the step angle for stepper motor in 8051.

The step angle is the maximum degree of rotation associated with a single step.
The relation between RPM steps per revolutions and step per second.
Step per second = RPM X steps for revolution / 60

18. What are the function of assembler and linker in 8051?

The assembler translate assembly language statement to their binary equivalents usually known as a object code.

At link time, separately assembled module is combined in to one single load module by the linker.

19. Mention the application of stepper motor.

1. **Industrial Machines** – Stepper motors are used in automotive gauges and machine tooling automated production equipments.
2. **Security -** new surveillance products for the security industry.
3. **Medical** – Stepper motors are used inside medical scanners, samplers, and also found inside digital dental photography, fluid pumps, respirators and blood analysis machinery.
4. **Consumer Electronics** – Stepper motors in cameras for automatic digital camera focus and zoom functions.

20. What are the different types of stepper motor?

There are three main types of stepper motors, they are:

1. Permanent magnet stepper
2. Hybrid synchronous stepper
3. Variable reluctance stepper

Permanent Magnet Stepper Motor: Permanent magnet motors use a permanent magnet (PM) in the rotor and operate on the attraction or repulsion between the rotor PM and the stator electromagnets.

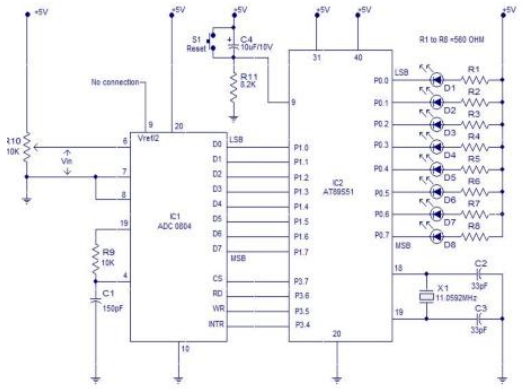
Variable Reluctance Stepper Motor: Variable reluctance (VR) motors have a plain iron rotor and operate based on the principle that minimum reluctance occurs with minimum gap, hence the rotor points are attracted toward the stator magnet poles.

Hybrid Synchronous Stepper Motor: Hybrid stepper motors are named because they use a combination of permanent magnet (PM) and variable reluctance (VR) techniques to achieve maximum power in a small package size.

21. Which register is used for serial programming in 8051? Illustrate it.

SBUF- SBUF register is used for serial communication .for a byte of data to be transferred via TxD line ,it must be placed in the SBUF register . SCON&PCON is also used for serial communication.

22. How is A/D converter interfaced with 8051? [may 2014]



PART-B

1. **Draw the diagram to interface a stepper motor with 8051 microcontroller and explain also write an 8051 ALP to run the stepper motor in both forward and reverse direction with delay.**
2. **Explain how interrupts are handled in 8051.**
3. **Write short notes on LCD interface.**
4. **Write notes on 8051 serial port programming.**
5. **Explain about external memory interfacing to 8051**
6. **Write notes on 8051 timer and counter programming.**
7. **Draw and explain the ADC interfacing using 8051.**
8. **Draw and explain the DAC interfacing using 8051.**
9. **Explain the keyboard interfacing using 8051**
10. **Explain the sensor interfacing using 8051**

18/05/18 (FN)

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

Question Paper Code : 40964

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Fourth/Fifth Semester

Electronics and Communication Engineering

EC 6504 – MICROPROCESSOR AND MICROCONTROLLER

(Common to Biomedical Engineering/Computer Science and Engineering/Medical Electronics/Information Technology)

(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Define stack pointer.
2. List the various addressing modes of 8086.
3. List two differences between maximum mode and minimum mode configuration of 8086.
4. What is meant by multiprogramming ?
5. Give the various modes of 8254 timer.
6. Write a 16-bit delay program in 8086.
7. Draw the pin diagram of 8051.
8. What are bit manipulation instructions ? Give two examples.
9. What are the types of sensors used for interfacing ?
10. Give the priority level of the interrupt sources in 8051.

PART – B (5×13=65 Marks)

11. a) Draw and explain the architecture of 8086 with neat diagram. (13)

(OR)

b) Explain in detail about the interrupts and interrupt service routines of 8086. (13)

12. a) Discuss the maximum mode configuration of 8086 with a neat diagram. Mention the functions of various signals. **(13)**

(OR)

b) Discuss about the multiprocessor configurations of 8086. **(13)**

13. a) Draw the block diagram and explain the operations of USART. **(13)**

(OR)

b) Explain in detail about DMA controller. **(13)**

14. a) Explain the architecture of 8051 with a neat diagram. **(13)**

(OR)

b) Discuss on the different addressing modes of 8051 with suitable examples. **(13)**

15. a) Describe the different modes of operation of timers/counters in 8051 with its associated registers. **(13)**

(OR)

b) Draw the diagram to interface a stepper motor with 8051 microcontroller and write an ALP to run the stepper motor in both forward and reverse direction with delay. **(13)**

PART – C **(1×15=15 Marks)**

16. a) Draw and explain the block diagram of alarm controller. **(15)**

(OR)

b) Draw the block diagram of traffic light control system using 8086. Write the algorithm and ALP for traffic light control system. **(15)**

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

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Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. The offset address of a data is $(341B)_H$ and the data segment register value is $(123A)_H$. What is the physical address of the data?
2. Define stack register.
3. What is meant by multiprogramming?
4. Write some example for advanced processors.
5. Draw the format of read back command register, of 8254.
6. Write a 16 bit delay program in 8086.
7. Which port used as multifunction port? List the signals.
8. Illustrate the CJNE instruction.
9. List the 8051 interrupts with its priority.
10. What are the types of sensors used for interfacing?

PART B — (5 × 13 = 65 marks)

11. (a) Draw and explain the architecture of 8086 with neat diagram.

Or

(b) Describe the interrupts of 8086 and its types with service routine.

12. (a) Explain the system bus structure of 8086. Draw the timing diagram for interrupt acknowledgement cycle.

Or

(b) Explain the closely looped configuration with neat diagram.

13. (a) Draw and explain the functional diagram of parallel communication interfacing chip.

Or

(b) Explain the need of DMA controller with its functional diagram.

14. (a) Write the available special function registers in 8051. Explain each register with its format and functions.

Or

(b) (i) Discuss the types of addressing mode with suitable example in 8051. (8)

(ii) Write an 8051 assembly language program to multiply the given number 48H and 30H. (5)

15. (a) Write a program for generation of unipolar square waveform of 1 KHz frequency using Timer0 of 8051 in mode0. Consider the system frequency as 12MHz.

Or

(b) Demonstrate the interfacing of the stepper motor with 8051 and explain its interfacing diagram and develop program to rotate the motor in clock wise direction.

PART C — (1 × 15 = 15 marks)

16. (a) Develop a 8086 based system to display the word HELLO for every 2ms in the common cathode seven segment LED display and check how many times the word displayed for one hour.

Or

(b) Develop 8051 based system design having 8Kbyte RAM to generate the triangular wave using DAC.