



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)  
Dundigal, Hyderabad - 500 043

## ELECTRICAL AND ELECTRONICS ENGINEERING

### TUTORIAL QUESTION BANK

Course Title	MICROPROCESSORS AND MICROCONTROLLERS				
Course Code	AECB24				
Programme	B.Tech				
Semester	FIVE				
Course Type	CORE				
Regulation	IARE - R18				
Course Structure	Theory			Practical	
	Lectures	Tutorials	Credits	Laboratory	Credits
	2	1	3	-	-
Course Faculty	Mrs. B Lakshmi Prasanna, Assistant Professor				

### COURSE OBJECTIVES

The students will try to learn:	
I	The architecture and operation of microprocessors and microcontrollers.
II	The programming and interfacing of Intel microprocessors, microcontrollers to design processor and controller based circuits.
III	The applications of microprocessors and microcontrollers in the field of Communications, Electronic measurement, control systems, Consumer electronics industry and other real-time systems.

### COURSE OUTCOMES:

After successful completion of the course, Students will be able to:		
CO No	Course Outcomes	Knowledge Level (Bloom's Taxonomy)
CO 1	<b>Outline</b> the internal architecture of 8085, 8086 and 8051 microcomputers to study their functionality.	Understand
CO 2	<b>Illustrate</b> the organization of registers and memory in 8086 for programming and memory allocation within processor.	Understand
CO 3	<b>Explain</b> various addressing modes and instruction set of target microprocessor and microcontroller useful for writing assembly language programs.	Understand
CO 4	<b>Distinguish</b> between minimum mode and maximum mode operation of 8086 microprocessor with timing diagrams.	Analyze



## TUTORIAL QUESTION BANK

MODULE-1				
8086 MICROPROCESSORS				
Part - A (Short Answer Questions)				
S.No	Question	Blooms taxonomy level	How does this Subsume the levels?	Course Outcomes
1.	Define Microprocessor and specify the power, clock requirements of 8085 microprocessor.	Remember	---	CO 1
2.	List the applications of microprocessor-based system.	Understand	The learner to have the knowledge of engineering to <b>Understand</b> the areas of microprocessor applications.	CO 1
3.	Compare the features of 8085 & 8086 microprocessor.	Understand	The learner to <b>Remember</b> the features of 8085 and 8086 microprocessors and <b>compare</b> them by <b>Understanding</b> the features.	CO 1
4.	Outline the flag register format of 8086.	Remember	---	CO 2
5.	List the branch instructions in 8086.	Remember	---	CO 3
6.	List the operating modes of 8086 microprocessor.	Remember	---	CO 4
7.	List all the features of 8086 microprocessor.	Remember	---	CO 1
8.	What are the functional units of 8086 microprocessor.	Remember	---	CO 1
9.	List two conditional jump instructions with an example.	Remember	---	CO 3
10.	What is the function of an accumulator?	Understand	The learner to <b>Recall</b> the register organization of microprocessor and <b>Understand</b> the function of each block	CO 1
11.	List the advantages of memory segmentation in 8086?	Understand	The learner to <b>Recall</b> the concept of memory mapping to <b>Understand</b> the advantage of memory segmentation in microprocessor	CO 1
12.	Why 8086 internal architecture is divided into BIU & EU?	Understand	The learner to <b>Recall</b> concept of pipelining process and <b>Understand</b> why to implement it in 8086 Architecture	CO 1
13.	What is the function of BIU?	Understand	The learner to <b>understand</b> the physical address calculations of microprocessor by BIU.	CO 1
14.	What are the minimum mode signals of 8086 microprocessor?	Remember	---	CO 4
15.	List the maximum mode signals of 8086 microprocessor.	Remember	---	CO 4
16.	What are different types of addressing modes of 8086?	Remember	---	CO 3
17.	Define Instruction format of microprocessor.	Remember	---	CO 3

18.	What is SEGMENT & ENDS	Understand	The learner to <b>Remember</b> assembler directives and <b>Understand</b> the function of program organization directives for Assembly Language Programming	CO 3
19.	Define assembler?	Remember	---	CO 3
20.	Find the maximum memory size that can be addressed by 8086?	Understand	The learner to <b>Recall</b> the features of microprocessor and <b>Understand</b> how to <b>find</b> the memory size	CO 1
<b>Part - B (Long Answer Questions)</b>				
1.	Explain about the following instructions. a. MOVS/MOVS/MOVSW b. CMPS/CMPSB/CMPSW c. REP/REPE/REPZ/REPNE d. LODS/LODSB/LODSW	Understand	The learner to <b>Recall</b> Instruction format , <b>Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming	CO 1
2.	Illustrate the functions of the following pins. i) TEST ii) Hold iii) QS0 & QS1 iv) S3, S4	Understand	The learner to <b>Remember</b> the Pin configuration of 8086 and <b>Understand</b> specific function of each signal and <b>explain</b> what happens when they are enabled or disabled	CO 4
3.	Explain about the various addressing modes of 8086 with examples.	Understand	The learner to <b>Remember</b> the addressing modes of 8086 microprocessor, <b>Understand</b> the way of accessing operands for assembly language programming and <b>explain</b> them by writing examples	CO 3
4.	Demonstrate about the internal blocks of 8086 by drawing the block diagram.	Understand	The learner to <b>Recall</b> the concept of microprocessor based system , <b>Understand</b> the execution of instructions by <b>Explaining</b> the function of each block	CO 1
5.	Explain the function of following Instructions of 8086. a. ADC b. AAS c. IMUL d. CBW	Understand	The learner to <b>Recall</b> Instruction format , <b>Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming	CO 3
6.	Explain about the following Instructions. i. WAIT ii. HLT iii. ESC iv. NOP	Understand	The learner to <b>Recall</b> Instruction format , <b>Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming	CO 3
7.	List all the Arithmetic instructions of 8086 microprocessor and explain with the help of examples.	Understand	The learner to <b>Recall</b> Instruction format , <b>Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming	CO 3

8.	Illustrate about the following pins in 8086 microprocessor. i. READY, ii. MN/MX, iii. HOLD and iv. HLDA	Understand	The learner to <b>Remember</b> the Pin configuration of 8086 and <b>Understand</b> specific function of each signal and <b>Explain</b> what happens when they are enabled or disabled	CO 4
9.	Illustrate various data transfer instructions of 8086 microprocessor with examples.	Understand	The learner to <b>Recall</b> Instruction format, <b>Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming	CO 3
10.	List all bit manipulation instructions of 8086 microprocessor and explain with examples.	Understand	The learner to <b>Recall</b> Instruction format, <b>Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming	CO 3
11.	Determine various string instructions used in 8086 microprocessor with examples.	Understand	The learner to <b>Recall</b> Instruction format, <b>Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming	CO 3
12.	List out the assembler directives of 8086 microprocessor and explain them with examples.	Understand	The learner to <b>Recall</b> the function of assembler and <b>Understand</b> how the assembler supports directives to define data, to organize segments, to control procedure, to define macros in assembly language programming	CO 3
13.	Outline the machine language instruction formats for the following. (i) Register to/from memory with displacement. (ii) Immediate operand to memory with 16-bit displacement.	Understand	The learner to <b>Remember</b> different machine language instruction formats and <b>Understand</b> about the operation code field and operand fields.	CO 1
14.	Explain about the control and conditional flags of 8086 microprocessor.	Understand	The learner to <b>Recall</b> the ALU operations and <b>Understand</b> the excitation of bits in flag registers of 8086 microprocessor and <b>Explain</b> how to observe the status of ALU.	CO 2
15.	Demonstrate about BIU and EU by drawing the block diagram of 8086.	Understand	The learner to <b>Recall</b> pipelining process and <b>understand</b> the physical address calculation, decoding and execution of instructions in microprocessor.	CO 1
16.	What is the importance of assembler directives in 8086 and explain them briefly?	Understand	The learner to <b>Recall</b> the function of assembler and <b>Understand</b> how the assembler supports directives to define data, to organize segments, to control	CO 3

			procedure, to define macros in assembly language programming	
17.	Explain about segments registers in 8086	Understand	The learner to <b>Recall</b> the architecture and <b>understand</b> about segment registers which stores the starting address of a data	CO 2
19.	Explain about the functions of the following pins. a. TEST b. RQ/GT0 & RQ/GT1 c. QS0 & QS1 d. S0,S1,S2	Understand	The learner to <b>Remember</b> the Pin configuration of 8086 and <b>Understand</b> specific function of each signal when they are enabled or disabled	CO 4
20.	Find minimum number of segment registers that are necessary to provide segmentation?	Understand	The learner to <b>Recall</b> the concept of segmentation and <b>Understand</b> about memory management mechanism	CO 3
21.	Explain about register organization of 8086 and write the purpose of each register.	Understand	The learner to <b>Understand</b> the architecture of microprocessor and <b>Identify</b> different registers that holds data, starting address, offset address.	CO 2
22.	Distinguish between linear memory and segmented memory with an example.	Understand	The learner to <b>Recall</b> the concept of memory segmentation and <b>Understand</b> the advantages of segmentation in 8086 microprocessor	CO 2
<b>Part - C (Analytical Questions)</b>				
1.	Explain minimum mode operations of 8086 and draw timing diagram for read operation.	Analyze	The learner to <b>Recall</b> the operating modes of 8086, <b>Remember</b> the architecture and <b>Understand</b> the operation and <b>analyze</b> with timing diagrams	CO 4
2.	Find the physical address for the given data i. 4370:561EH ii. 7A32:0028H	Apply	The learner to <b>Recall</b> the concept of memory mapping, <b>Understand</b> segmentation mechanism and <b>Apply</b> it to <b>Calculate</b> the physical address using segment address and offset address.	CO 1
3.	Demonstrate on minimum mode operations of 8086 and draw timing diagram for write operation.	Analyze	The learner to <b>Recall</b> the operating modes of 8086, <b>Remember</b> the architecture and <b>Understand</b> the operation and <b>analyze</b> with timing diagrams	CO 4
4.	Estimate the memory address of the next instruction executed by the microprocessor, when operated in the real mode, for the following CS:IP combinations: i) CS=1000H and IP=2000H ii) CS=2000H and IP=1000H	Apply	The learner to <b>Recall</b> the concept of memory mapping, <b>Understand</b> segmentation mechanism and <b>Apply</b> it to <b>Calculate</b> the physical address using segment address and offset address.	CO 1
5.	Explain about maximum mode operations of 8086 and draw timing diagram for memory read operation.	Analyze	The learner to <b>Recall</b> the operating modes of 8086, <b>Remember</b> the architecture and <b>Understand</b>	CO 4

			the operation and <b>analyze</b> with timing diagrams	
6.	Explain about maximum mode operation of 8086 and draw Timing diagram for memory write operation.	Analyze	The learner to <b>Recall</b> the operating modes of 8086, <b>Remember</b> the architecture and <b>Understand</b> the operation and <b>analyze</b> with timing diagrams	CO 4
7.	Outline the general bus operation of a microprocessor with neat timing diagrams.	Analyze	The learner to <b>Understand</b> the architecture of processor and <b>explain</b> its operation and <b>analyze</b> with timing diagrams	CO 4
8.	Explain in detail about Flag manipulation instructions of 8086 microprocessor with example.	Understand	The learner to <b>Recall</b> Instruction format , <b>Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming	CO 3
9.	Find the physical address for the following: MOV AX, [BX] [SI] MOV AX, 5000 [BX] [SI] given offset (displacement)=5000H [AX]=1000H, [BX]=2000H, [SI]=3000H, [DI]=4000H, [BP]=5000H, [SP]=6000H, [CS]=0000H, [DS]=1000H, [SS]=2000H, [IP]=7000H	Apply	The learner to <b>Recall</b> the concept of memory mapping, <b>Understand</b> segmentation mechanism and <b>Apply</b> it to <b>Calculate</b> the physical address using segment address and offset address.	CO 2
10.	Illustrate about the operation carried out when the following instructions are executed by 8086. i. MOV [SI],AX ii. MOV [BX],CX iii. XLAT iv. MUL,BL v. DIV,BL	Understand	The learner to <b>Recall</b> Instruction format , <b>Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming.	CO 3

## MODULE-II

### PROGRAMMING WITH 8086 MICROPROCESSOR

#### Part – A (Short Answer Questions)

1.	Define Assembler.	Remember	---	CO 3
2.	Define Compiler.	Remember	---	CO 3
3.	Define Interpreter.	Remember	---	CO 3
4.	What are different hardware interrupts in 8086?	Remember	---	CO 5
5.	Distinguish between Machine level language and assembly level language	Understand	The learner to <b>Understand</b> the difference between Machine level language and assembly level language and <b>identify</b> which programming language is better	CO 3
6.	How to retrieve data from stack memory of 8086 microprocessor	Understand	The learner to <b>Understand</b> the stack structure and then <b>explain</b> the procedure of retrieving data from stack	CO 2
7.	Define interrupt vector table.	Remember	---	CO 5

8.	Define interrupt service routine.	Remember	---	CO 5
9.	Distinguish between maskable and non-maskable interrupts?	Understand	The learner to <b>Remember</b> the concept of Interrupt and <b>Understand</b> the classification of interrupts and <b>Compare</b> them with respect to interrupt request	CO 5
10.	What is meant by polling?	Understand	The learner to <b>Remember</b> the concept of Interrupts and <b>Understand</b> different methods for data transferring between processor and I/O devices	CO 5
11.	List the priorities of 8086 interrupts.	Remember	---	CO 5
12.	What is the function of INT-03H interrupt.	Understand	The learner to <b>Recall</b> Interrupt Vector Table and <b>Remember</b> about dedicated interrupts and <b>Understand</b> each interrupt and <b>identify</b> the interrupt used for break point in the program	CO 5
13.	How the interrupt response of a 8086 microprocessor is performed.	Understand	The learner to <b>Remember</b> the concept of interrupt and <b>Understand</b> how to accept and execute an interrupt request	CO 5
14.	List different Types of interrupts in 8086 microprocessor	Remember	---	CO 5
15.	Classify different levels of programming languages.	Understand	The learner to <b>Understand</b> what is programming language and different levels of programming languages, and then <b>identifies</b> which programming language is better.	CO 3
16.	What are DOS and BIOS interrupts.	Remember	---	CO 5
17.	How the following DOS interrupts function. (i) Function Call 01 (ii) Function Call 02	Remember	---	CO 5
18.	What is the function of following BIOS interrupts. (i) INT 10 (ii) INT 21	Remember	---	CO 5
19.	How pipe lining is achieved in 8086.	Understand	The learner to <b>Recall</b> the architecture of 8086 and <b>Understand</b> the operation to execute an instructions	CO 4
20.	Compare the following interrupts. i) NMI ii) INTR	Understand	The learner to <b>Recall</b> the pin configuration of 8086, <b>Remember</b> the classification of interrupts and <b>Understand</b> how to mask and unmask interrupts during interrupt request at these signals	CO 5

**Part - B (Long Answer Questions)**

1.	Explain the stack structure of 8086 microprocessor with PUSH and POP instructions.	Understand	The learner to <b>Understand</b> how the data is arranged in the stack and then <b>explain</b> how to insert and retrieve data using instructions	CO 3
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2.	Interpret different levels of programming languages and write their advantages and disadvantages	Understand	The learner to <b>Understand</b> what is programming language and different levels of programming languages, and then <b>identify</b> which programming language is better.	CO 3
3.	Illustrate the execution of CALL instruction and discuss what is the role of stack in calling a subroutine and returning from the routine.	Understand	The learner to <b>Understand</b> stack structure and then <b>explain</b> how to call a subroutine and how to return from a subroutine	CO 3
4.	Develop an assembly language program to divide 16 bit data with 8 bit data and 32 bit data with 16 bit data	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
5.	Demonstrate the process of executing assembly language program using MASM assembler	Understand	The learner to <b>Remember</b> the procedural steps of executing assembly language program using MASM assembler <b>Understand</b> how to execute it and see the result.	CO 3
6.	Outline the machine language instruction formats for the following. (i) Register to/from memory with no displacement. (ii) Immediate operand to Register.	Remember	---	CO 3
7.	Develop an assembly language program to perform 2's complement in 8086.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
8.	Evaluate the physical address of the top of the stack? If the stack segment register contains 3000H and the stack pointer Register contains 8434H.	Apply	The learner to <b>Recall</b> the concept of memory mapping, <b>Understand</b> segmentation mechanism and <b>Apply</b> it to <b>Calculate</b> the physical address using segment address and offset address.	CO 1
9.	Develop an assembly language program to convert packed BCD number to Unpacked BCD number.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
10.	Outline the interrupt structure of 8086 microprocessor and explain.	Understand	The learner to <b>Remember</b> the concept of Interrupts and its structure <b>Understand</b> the allocation	CO 5

			of all the interrupts in interrupt table	
11.	Explain about interrupt handling mechanism in 8086 microprocessor.	Understand	The learner to <b>Understand</b> the process of halting main program temporarily and executing ISR by <b>Recalling</b> IVT Concept during interrupt request	CO 5
12.	Illustrate about the interrupt cycle of 8086 microprocessor.	Understand	The learner to <b>Understand</b> the process of executing interrupt by <b>Recalling</b> IVT Concept during interrupt request	CO 5
13.	Outline 8086 Interrupt groups in interrupt vector table.	Understand	The learner to <b>Remember</b> the structure of Interrupt vector Table and <b>Understand</b> the allocation of all the interrupts under different groups	CO 5
14.	Distinguish between polling method and interrupt method in 8086 interrupts	Understand	The learner to <b>Recall</b> what is interrupt and <b>identify</b> and <b>understand</b> different types of interrupts	CO 5
15.	What operation is performed during handling an interrupt service.	Understand	The learner to <b>Understand</b> the process of halting main program temporarily and executing ISR by <b>Recalling</b> IVT Concept during interrupt request	CO 5
16.	List out different types of DOS interrupts and write their functions.	Understand	The learner to <b>Understand</b> different types of interrupts and <b>Explain</b> about interrupts that perform special functions	CO 5
17.	Illustrate about different types of BIOS interrupt and write their functions.	Understand	The learner to <b>Understand</b> different types of interrupts and <b>Explain</b> about interrupts that perform special functions	CO 5
18.	Explain the functions of the following DOS interrupts. I. Function Call 01 II. Function Call 02 III. Function Call 03 IV. Function Call 04	Understand	The learner to <b>Understand</b> different types of interrupts and <b>Explain</b> about interrupts that perform special functions	CO 5
19.	Illustrate about the functions of the following BIOS interrupts. I. INT10 II. INT11 III. INT12 IV. INT13	Understand	The learner to <b>Understand</b> different types of interrupts and <b>Explain</b> about interrupts that perform special functions	CO 5
20.	Summarize the concept of Interrupts in 8086 microprocessor.	Understand	The learner to <b>Understand</b> different types of interrupts and their functions ,need of Interrupt Vector table and <b>explain</b> the process of interrupt handling mechanism during interrupt request	CO 5

**Part - C (Analytical Questions)**

1.	Develop an assembly language program to sort the values in ascending order.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
2.	Develop an assembly language program to reverse the given string "1, 2, 3, 4,5, 6".	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
3.	Write an assembly language program to move a block a data from one memory location to another memory location?	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
4.	Develop an assembly language program to delete a byte in a string?	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
5.	Develop an assembly language program to find sum of squares.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
6.	Develop an assembly language program to sort the values in descending order.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
7.	Develop an assembly language program to perform multi byte addition and multi byte subtraction.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
8.	Explain how the interrupt is serviced by PIC If more interrupts occurs at the same time.	Understand	The learner to <b>Understand</b> different types of interrupts and their priorities and	CO 5,C O 6

			<b>Explain</b> about interrupt servicing process based on priorities in PIC	
9.	Compare polling method and Interrupt method and explain which method is generally preferred and why.	Understand	The learner to <b>Understand</b> different methods to transfer data between processor and I/O device and then able to <b>Identify</b> the better interrupt method.	CO 5
10.	Develop assembly language program to convert packed BCD number to ASCII using 8086 microprocessor.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3

### MODULE-III

#### INTERFACING WITH 8086/88

##### Part - A (Short Answer Questions)

1.	List out the features of the 8255 PPI (Programmable Peripheral Interface).	Remember	---	CO 6
2.	How many I/O modes of operations present in 8255 Programmable Peripheral Interface.	Remember	---	CO 6
3.	List out the applications of stepper motor.	Understand	The learner to <b>Understand</b> the concept of stepper motor and then <b>explain</b> the area of application	CO 6
4.	What is the need for Analog to Digital Converter.	Understand	The learner to <b>Understand</b> the types of converters and then <b>explain</b> the necessity of conversion	CO 6
5.	What is the need for Digital to Analog Converter.	Understand	The learner to <b>Understand</b> the types of converters and then <b>explain</b> the necessity of conversion	CO 6
6.	Outline bit set or reset (BSR) mode in 8255?	Remember	---	CO 6
7.	What is the use of Port-C signals in 8255?	Understand	The learner to <b>Recall</b> different ports available in 8255, <b>Understand</b> the purpose of each port and then <b>explain</b> about the use of port C signals	CO 6
8.	What is the purpose of 8255 in interfacing with external devices?	Understand	The learner to <b>Understand</b> about the ports of 8255, and then <b>explain</b> why 8255 is used for interfacing external devices	CO 6
9.	Which bit of a control word for the 8255 compares between the I/O mode and the BSR mode?	Understand	The learner to <b>Remember</b> control word register format, <b>Understand</b> about the bits of CWR and then <b>explain</b> about the bit which makes the difference	CO 6
10.	List out different types of modes in I/O mode of 8255.	Remember	---	CO 6

CIE-II				
11.	What is the need of 8259A PIC.	Understand	The learner to <b>Remember</b> the concept of interrupts, and then <b>Explain</b> how to handle interrupts when they occur at a time	CO 6
12.	List out the features of 8259A Programmable Interrupt Controller.	Remember	---	CO 6
13.	Outline the format of ICW1 in 8259 PIC.	Understand	The learner to <b>Remember</b> the allotment of bits in a register, and <b>Understand</b> about the operation of each bit.	CO 6
14.	Compare different types of communications in microprocessor.	Understand	The learner to <b>Understand</b> different ways of transmitting data between computer and peripherals and then <b>Compare</b> considering area of applications	CO 7
15.	What is the need of 8251 (Universal Synchronous Asynchronous Receiver Transmitter) chip.	Understand	The learner to <b>Remember</b> different types of communication and <b>Understand</b> what type of communication is performed in computers and peripherals and then <b>Explain</b> how to convert the data and transmit	CO 6,CO 7
16.	List the features of 8251(Universal Synchronous Asynchronous Receiver Transmitter).	Remember	---	CO 6,CO 7
17.	Why serial data transfer is preferred over parallel data transfer for microprocessor communication.	Understand	The learner to <b>Recall</b> different types of communication and <b>Understand</b> what type of communication is performed in computers and peripherals and then <b>explaining</b> which method is preferable to transmit data over longer distances	CO 7
18.	What are the operating modes of 8257 DMA controller.	Remember	---	CO 6
19.	What is the need of 8257 DMA controller.	Understand	The learner to <b>Understand</b> the way of Data transfer between device and memory	CO 6
20.	List out the features of 8257 DMA controller.	Remember		CO 6
<b>Part - B (Long Answer Questions)</b>				
1.	Explain the internal architecture of 8255 Programmable Peripheral Interface with a neat diagram.	Understand	The learner to <b>Understand</b> the need of 8255 Programmable Peripheral Interface and then <b>explain</b> about the functionality of each block	CO 6
2.	Outline the control word format of 8255 Programmable Peripheral Interface in I/O mode.	Understand	The learner to <b>Understand</b> about each bit in control word format and then <b>explain</b> how Programmable Peripheral Interface operates based on CWR	CO 6
3.	Illustrate how Analog to digital converter can be interfaced with 8086	Apply	The learner to <b>Understand</b> about Analog to digital	CO 6

	microprocessor by drawing a neat diagram.		converter and 8086 microprocessor and then <b>explain</b> how to <b>apply</b> interfacing between them using 8255	
4.	Demonstrate how Digital to Analog converter can be interfaced with 8086 microprocessor by drawing a neat diagram.	Apply	The learner to <b>Understand</b> about Digital to Analog converter and 8086 microprocessor and then <b>explain</b> how to <b>apply</b> interfacing between them using 8255	CO 6
5.	Explain different modes of operation of 8255 (Programmable Peripheral Interface).	Understand	The learner to <b>Understand</b> about different operating modes of 8255 Programmable Peripheral Interface	CO 6
6.	Outline the interfacing diagram of 8255 with 8086 microprocessor with a neat sketch.	Apply	The learner to <b>Understand</b> about 8255 (Programmable Peripheral Interface) and 8086 microprocessor and then <b>explain</b> how to <b>apply</b> interfacing between them	CO 6
7.	Illustrate how a stepper motor can be interfaced with 8086 microprocessor with a neat diagram	Apply	The learner to <b>Understand</b> about stepper motor and 8086 microprocessor and then <b>explain</b> how to <b>apply</b> interfacing between them using 8255	CO 6
8.	Explain the control word format of 8255 in BSR mode.	Understand	The learner to <b>Understand</b> about each bit in control word format and then <b>explain</b> how Programmable Peripheral Interface operates based on CWR	CO 6
9.	Draw and explain the pin diagram of 8255 Programmable Peripheral Interface and write the functionality of each pin.	Understand	The learner to <b>Remember</b> the pin diagram of 8255 Programmable Peripheral Interface and <b>Understand</b> about the functionality of each pin	CO 6
10.	Demonstrate how to control high power devices using 8255.	Understand	The learner to <b>Understand</b> how to control high power devices using I/O ports of a microcomputer system and <b>explain</b> how to produce isolation between low power and high power circuits	CO 6
<b>CIE-II</b>				
11.	Explain the internal architecture of 8259 Programmable Interrupt Controller with a neat block diagram.	Understand	The learner to <b>Recall</b> the concept of interrupts and their priorities , <b>Understand</b> the functionality of each block in the architecture and then <b>Explain</b> the operation how to handle more number of Interrupts	CO 5,CO 6
12.	Illustrate different types of command words used in 8259 PIC?	Understand	The learner to <b>Understand</b> the ways of programming 8259A and <b>Explain</b> how to service the interrupts	CO 6

13.	Outline the formats of Initialization Command Words and explain in detail.	Understand	The learner to <b>Understand</b> the ways of programming 8259A and then <b>Explain</b> about the importance of each bit in the register for initializing PIC	CO 6
14.	Explain about the following Operating modes of 8259A PIC. (i) Fully Nested Mode (ii) Automatic Rotation Mode (iii) Specific Rotation Mode (iv) Automatic EOI	Understand	The learner to <b>Recall</b> the architectures of PIC, <b>Understand</b> ISR block and <b>explain</b> how interrupt priorities will be changed based on operating modes	CO 6
15.	Outline the internal block diagram of 8251 USART and explain about each block in detail.	Understand	The learner to <b>Recall</b> the need of DMA controller and <b>Explain</b> about the architecture by <b>Understanding</b> the function of each block for data transfer between microprocessor and peripherals	CO 6,CO 7
16.	Explain the pins of 8251 USART (Universal Synchronous Asynchronous Receiver Transmitter) by drawing pin diagram.	Understand	The learner to <b>Remember</b> the pin diagram and <b>Understand</b> the functionality of all signal to communicate microprocessor and peripherals	CO 6,CO 7
17.	Illustrate about synchronous mode transmitter and receiver data formats of 8251.	Understand	The learner to <b>Remember</b> different types of communication and <b>Understand</b> what type of communication is performed in computers and peripherals and then <b>explain</b> how to convert the data and transmit	CO 7
18.	Explain the logic to convert RS232C to TTL and TTL to RS232 conversion.	Understand	The learner to <b>Remember</b> the voltage levels of TTL and RS232 and <b>Explain</b> why to convert the levels before transmitting and receiving	CO 7
19.	Illustrate the need of DMA controller and its interfacing to 8086 with a neat interfacing diagram.	Understand	The learner to <b>Recall</b> different types of communication and <b>Understand</b> what type of communication is performed in computers and peripherals and then <b>Explain</b> how to convert the data and transmit	CO 6
20.	Outline the architecture of 8257 DMA controller and explain about each block?	Understand	The learner to <b>Understand</b> the need of DMA controller and then <b>Explain</b> the functionality of each block for data transfer between memory and I/O	CO 6
21.	Explain the pin configuration of 8257 DMA controller with the neat sketch.	Understand	The learner to <b>Remember the</b> pin diagram of DMA controller and <b>Understand</b> the functionality of each pin	CO 6
22.	Explain in detail about 8279 interfacing with 8086 microprocessor by drawing a neat diagram.	Apply	The learner to <b>Understand</b> the architecture of 8279 and 8086 and then <b>explain</b> how to <b>Apply</b> interface between 8279 and 8086	CO 6

**Part - C (Analytical Questions)**

1	Develop an assembly language Program to generate the square wave of voltage from 1V to 5V with frequency of 5 KHz. (Assume oscillator frequency of 8 MHz).	Apply	The learner to <b>develop</b> an assembly language Program to generate the square wave by <b>applying</b> interfacing between D/A converter and 8086 microprocessor	CO 3,CO 6
2	Develop an assembly language program to interface stepper motor with 8086 and rotate in clock wise direction with speed of 30RPM. (Assume oscillator frequency of 8 MHz).	Apply	The learner to <b>develop</b> an assembly language Program to rotate stepper motor in clock wise direction by <b>applying</b> interfacing between stepper motor and 8086 microprocessor	CO 3,CO 6
3	Develop an assembly language program to interface stepper motor with 8086 and rotate in anticlock wise direction with speed of 30RPM. (Assume oscillator frequency of 8 MHz).	Apply	The learner to <b>develop</b> an assembly language Program to rotate stepper motor in anticlock wise direction by <b>applying</b> interfacing between stepper motor and 8086 microprocessor	CO 3,CO 6
4	Develop an assembly language Program to generate the triangular wave of voltage from 1V to 5V. (Assume oscillator frequency of 8MHz).	Apply	The learner to <b>develop</b> an assembly language Program to generate the triangular wave by <b>applying</b> interfacing between D/A converter and 8086 microprocessor	CO 3,CO 6
5	Explain how to Interface two 4K X 8 EPROMS and two 4K X 8 RAM chips with 8086 microprocessor.	Apply	The learner to <b>Understand</b> about memory mapping and then <b>explain</b> how to <b>Apply</b> memory interfacing with 8086 microprocessor	CO 3,CO 6
<b>CIE-II</b>				
6	Illustrate the process of Interrupt sequence in 8086 microprocessor.	Understand	The learner to <b>Understand</b> the process of halting main program temporarily and executing ISR by <b>Recalling</b> Interrupt Vector Table Concept during interrupt request	CO 5
7	Outline the flow chart of Initialization sequence (ICWs) of 8259A.	Understand	The learner to <b>Explain</b> how to program 8259 and what is the sequence to be followed to initialize 8259	CO 6
8	Explain the communication process between DCE and DTE .	Understand	The learner to <b>understand</b> the functioning of RS-232 pins and then <b>explain</b> communication process using handshaking signals	CO 7
9	Illustrate the need of RS232 between a Computer and a Modem with the help of neat diagram.	Understand	The learner to <b>Remember</b> communication standards, <b>understand</b> the functioning of RS-232 pins and then <b>explain</b> communication process between DTE and DCE using handshaking signals	CO 7
10	Explain how the data transfer is performed between memory and I/O	Understand	The learner to <b>Understand</b> the need of DMA controller	CO 6



	devices in the presence of DMA controller and in the absence of DMA controller.		and then <b>Explain</b> the data transfer between memory and I/O	
<b>MODULE-IV</b>				
<b>8051 MICROCONTROLLER</b>				
<b>Part - A (Short Answer Questions)</b>				
1.	Compare microprocessor and microcontroller.	Understand	The learner to <b>identify</b> the difference with respect to their features and area of applications	CO 1
2.	What is the significance of EA line of 8051 microcontroller?	Understand	The learner to <b>Remember</b> the pins of 8051 microcontroller and <b>explain</b> how to read program from external memory	CO 1
3.	Compare between MOVX and MOV instructions.	Understand	The learner to <b>Recall</b> Instruction format, <b>Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming	CO 3
4.	What is the size of the on-chip program memory and on-chip data memory of 8051 microcontroller	Understand	The learner to <b>Understand</b> about memory organization of 8051 microcontroller	CO 9
5.	List out the advantages of using a microcontroller in place of a microprocessor.	Understand	The learner to <b>Remember</b> the feature of microprocessor and microcontroller and <b>Understand</b> the limitations in microprocessor	CO 1
6.	How does DPTR function in 8051 microcontroller.	Understand	The learner to <b>understand</b> the function of Data pointer when it is enabled and disabled	CO 1
7.	List the applications of 8051 microcontroller.	Understand	The learner to <b>Remember</b> the feature of 8051 microcontroller and <b>Understand</b> the area of application	CO 1
8.	What are the functions of RESET and EA signals in 8051 microcontroller?	Understand	The learner to <b>Remember</b> the pins of 8051 microcontroller and <b>explain</b> the function of pins when they are enabled and disabled	CO 1
9.	What are the features of 8051 microcontroller?	Remember	---	CO 1
10.	What are the functions of ALE and PSEN signals in 8051 microcontroller.	Understand	The learner to <b>Remember</b> the pins of 8051 microcontroller and <b>explain</b> the function of pins when they are enabled and disabled	CO 1
11.	How does XTAL1 and XTAL2 in 8051 microcontroller function.	Understand	The learner to <b>Remember</b> the pins of 8051 microcontroller and <b>explain</b> how to produce clock frequency	CO 1
12.	List all the register banks in 8051 microcontroller.	Remember	---	CO 9
13.	What is direct addressing mode of 8051 microcontroller give an example.	Understand	The learner to <b>Remember</b> <b>Understand</b> and <b>analyze</b> the	CO 3

			way of accessing operands for assembly language programming	
14.	What is indexed addressing mode of 8051 microcontroller give an example.	Understand	The learner to <b>Understand</b> and <b>analyze</b> the way of accessing operands for assembly language programming	CO 3
15.	List out any four alternate functions of port 3 of 8051 microcontroller	Understand	The learner to <b>Understand</b> the number of ports available in 8051 microcontroller and then <b>explain</b> about the function of port 3	CO 1
16.	List out different addressing modes supported by 8051 microcontroller	Remember	---	CO 3
17.	Which port is used to address external memory in 8051?	Understand	The learner to <b>Remember</b> the number of ports available in 8051 microcontroller and then <b>explain</b> about the port that addresses external memory	CO 1
18.	List out different addressing modes in 8051 micro controller.	Remember	---	CO 3
19.	What is direct addressing mode give an example.	Understand	The learner to <b>Remember</b> addressing modes in 8051 micro controller and <b>Understand</b> about direct addressing mode .	CO 3
20.	How DIV instruction is executed in 8051 micro controller.	Understand	The learner to <b>Remember</b> about the instruction set in 8051 micro controller and <b>Understand</b> about the function of DIV instruction	CO 3

**Part – B (Long Answer Questions)**

1.	Outline the register organization of 8051 Microcontroller with examples.	Understand	The learner to <b>Understand</b> Register organization of 8051 Microcontroller and <b>Explain</b> in what way each register can be used for programming	CO 9
2.	Explain the architecture of 8051 micro controller.	Understand	The learner to <b>Remember</b> the architecture and <b>Understand</b> the function of each block	CO 1
3.	Illustrate the addressing modes of 8051 microcontroller with examples	Understand	The learner to <b>Understand</b> and <b>analyze</b> the way of accessing operands for assembly language programming	CO 3
4.	Compare between AJMP, LJMP and SJMP instructions of 8051 microcontroller.	Understand	The learner to <b>Recall</b> Instruction format , <b>Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming	CO 3
5.	Illustrate various conditional instructions of 8051 micro controller and their effect on flags.	Understand	The learner to <b>Recall</b> Instruction format , <b>Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming	CO 3

6.	Demonstrate about the external memories in 8051 and draw the diagram to interface external memories to 8051.	Understand	The learner to <b>Recall</b> Classification of memories and <b>Understand</b> the concept of memory organization in 8051 Microcontroller and the requirement of external memory	CO 9
7.	Explain about the register set of 8051 Microcontroller with examples.	Understand	The learner to <b>Understand</b> Register organization of 8051 Microcontroller and <b>Explain</b> in what way each register can be used for programming	CO 9
8.	What are different methods to access external memory devices in an 8051 based system.	Understand	The learner to <b>Recall</b> Classification of memories and <b>Understand</b> different methods to access external memory for storing complex programs	CO 9
9.	Explain the operation of I/O ports in 8051 with neat sketch.	Understand	The learner to <b>Understand</b> about different ports of 8051 microcontroller and then <b>Explain</b> the pin occupation of each port	CO 1
10.	Outline the functional diagram of 8051 Microcontroller and explain the Input /Output lines.	Understand	The learner to <b>Understand</b> the block diagram of 8051 Microcontroller and <b>Explain</b> about all I/O ports and the pin occupation of each port	CO 1
11.	List out the features of 8051 microcontroller and compare it with 8086 microprocessor.	Understand	The learner to <b>Recall</b> the features of 8086 microprocessor and <b>Understand</b> in what way 8051 microcontroller differs from it	CO 1
12.	List out the features of Special Function Registers of 8051 Microcontroller. Explain.	Understand	The learner to <b>Understand</b> Register organization of 8051 Microcontroller and then <b>Explain</b> the purpose Special Function Registers	CO 9
13.	Outline the PSW register format in 8051 and give example instructions which effect the respective flags.	Understand	The learner to <b>Remember</b> Flag Register Format and <b>Understand</b> the excitation of bits in flag register during ALU operations	CO 9
14.	Illustrate about the internal and external data memory organization of 8051	Understand	The learner to <b>Recall</b> Classification of memories and <b>Understand</b> at what condition we have to use these memories	CO 9
15.	List out the various 16 bit registers of 8051 and write the operation with examples.	Understand	The learner to <b>Understand</b> Register organization of 8051 Microcontroller, <b>Identify</b> 16 bit registers and then <b>Explain</b> the performance of each register	CO 9
16.	Demonstrate on various instructions to transfer data from external and internal memory in 8051 microcontroller.	Understand	The learner to <b>Recall</b> Instruction format, <b>Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of	CO 3

			each Instruction for assembly language programming	
17.	Illustrate various unconditional jump instructions of 8051 micro controller	Understand	The learner to <b>Recall</b> Instruction format <b>,Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming	CO 3
18.	Explain how logical operations are carried out in 8051 microcontroller and their effect on flags.	Understand	The learner to <b>Recall</b> Instruction format <b>,Remember</b> the layout of bits of an instruction and <b>Understand</b> the function of each Instruction for assembly language programming	CO 3
19.	Demonstrate how stack operations can be done in 8051 microcontroller	Understand	The learner to <b>Understand</b> how the data is arranged in the stack and then <b>explain</b> how to insert and retrieve data using instructions	CO 3
20.	Develop ALP for 16 bit addition in 8051 microcontroller and show the PSW	Understand	The learner to <b>Understand</b> the concepts of Instruction Set and addressing modes and <b>Analyze</b> the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language programming	CO 3

**Part - C (Analytical Questions)**

1.	Develop an ALP to find positive and negative numbers in given array in 8051 microcontroller.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
2.	Develop an ALP for finding even and odd numbers in given array in 8051 microcontroller.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
3.	Develop 8051 program to move a array of data between two external memory blocks.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
4	Develop an ALP for finding the largest number in given array using 8051 microcontroller.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
5.	Develop a program to find the average of five 8 bit numbers. Store the result in 55H in 8051 microcontroller.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler	CO 3

			directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	
6.	Develop an ALP for finding the smallest number in given array using 8051 microcontroller.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
7.	Develop a program to generate a delay of 1 millisecond without using timers in 8051 microcontroller.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
8.	Develop a program to transfer this block data to memory locations with starting address 6000h. Assume Ten bytes are stored in external data memory starting at 5000h.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
9.	Develop assembly language program to toggle 8 bits of port1 with delay of 100ms in 8051 microcontroller.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3
10.	Develop 8051 program to convert packed BCD number available in accumulator, into two ASCII numbers and save them in internal RAM locations 48H and 49H.	Apply	The learner to <b>Understand</b> the concepts of Instruction Set, addressing modes, assembler directives and write the algorithm with an example and then <b>apply</b> it <b>develop</b> the assembly language program	CO 3

## MODULE-V

### SYSTEM DESIGN USING MICROCONTROLLER

#### Part - A (Short Answer Questions)

1.	Interpret the PCON register in 8051 microcontroller.	Understand	The learner to <b>Understand</b> how 8051 microcontroller enters into power saving mode by <b>explaining</b> about two power saving mode bits	CO 9
2.	Outline the control word format for Programmable timer in 8051 Microcontroller.	Understand	The learner to <b>Understand</b> about each bit in CWR and then <b>explain</b> how to program timer in 8051 microcontroller	CO 8
3.	Classify the types of communication with examples in 8051 Microcontroller.	Understand	The learner to <b>Understand</b> different ways of transmitting data between computer and peripherals and then <b>Compare</b> considering area of applications	CO 7

4.	Which register is used for serial programming in 8051 Microcontroller.	Remember	---	CO 7
5.	Outline the format of Timer control register (TCON) 8051 microcontroller	Understand	The learner to <b>Understand</b> about TCON register and <b>explain</b> how it is used to control operations of counter and timers in microcontroller	CO 8
6.	Summarize the function of the Timer mode (TMOD) register in 8051 Microcontroller.	Understand	The learner to <b>identify</b> different timers in 8051 microcontroller and <b>Understand</b> about TMOD register and then <b>explain</b> how to set timer mode	CO 8
7.	How many clock pulses exist in one machine cycle of 8051 Microcontroller.	Remember	---	CO 1,CO 9
8.	Interpret the Timer mode register (TMOD) format in 8051 Microcontroller.	Understand	The learner to <b>identify</b> different timers in 8051 microcontroller and <b>Understand</b> about TMOD register and then <b>explain</b> how to set timer mode	CO 8
9.	Find the minimum and maximum counts in Timer mode 1 of 8051 microcontroller.	Remember	---	CO 8
10.	List the three internal interrupts of 8051 microcontroller.	Remember	---	CO 5
11.	Compare Timer and Counter.	Understand	The learner to <b>Understand</b> about function of timer and Counter by <b>Recalling</b> how to generate delays	CO 8
12.	What are different Modes of timer operation.	Remember	---	CO 8
13.	What is the function of the following registers. (i) PCON (ii) IP	Understand	The learner to <b>Remember</b> registers of 8051 Microcontroller and <b>Understand</b> the function of registers	CO 9
14.	Interpret the Interrupt Enable register format of 8051 Microcontroller.	Understand	The learner to <b>Remember</b> the format of Interrupt Enable register and <b>Understand</b> how to enable and disable the interrupts	CO 5
15.	Outline the format of Interrupt Enable Register in 8051 Microcontroller.	Understand	The learner to <b>Remember</b> registers of 8051 Microcontroller and <b>explain</b> how to enable and disable the interrupts	CO 5
16.	List out different types of interrupts available in 8051 Microcontroller.	Remember	---	CO 5
17.	Distinguish between internal and external interrupts in 8051 Microcontroller.	Understand	The learner to <b>Remember</b> the interrupts that are available in 8051 Microcontroller and <b>Understand</b> about the function of each interrupt	CO 5
18.	Interpret the Interrupt Priority register format of 8051 Microcontroller.	Remember	---	CO 5

19.	Compare between interrupt vectors and interrupt service routine	Understand	The learner to <b>Understand</b> the difference in executing interrupts	CO 5
20.	List out relevant port bits assigned for external interrupts in 8051 Microcontroller.	Remember	---	CO 5
<b>Part – B (Long Answer Questions)</b>				
1.	Demonstrate with a neat diagram to interface a stepper motor with 8051 microcontroller and explain.	Understand	The learner to <b>Understand</b> the operation of stepper motor and then <b>explain</b> how to interface it with 8051 microcontroller	CO 9
2.	Interpret about Interrupt enable register and Interrupt Priority register in 8051 Microcontroller	Understand	The learner to <b>Recall</b> what is interrupt and <b>Understand</b> register formats and then <b>Explain</b> how to enable and disable interrupts and how to change the priorities of interrupts using these registers	CO 5
3.	Explain the concept of serial communication in 8051 and hence describe how SCON register is configured.	Understand	The learner to <b>Recall</b> the basics of serial communication, <b>Understand</b> about SCON register format and then <b>explain</b> how to program start bit, stop bit and data bits	CO 7
4.	How to interface 8-bit Analog to Digital Converter (ADC) with 8051 microcontroller. Explain.	Apply	The learner to <b>Recall</b> operation of ADC and Microcontroller <b>Understand</b> about types of communication and <b>Apply</b> interfacing in between them to communicate	CO 9
5.	Demonstrate on the interrupt management system in 8051 microcontroller.	Understand	The learner to <b>Recall</b> what is interrupt and <b>Understand</b> about interrupt handling mechanism	CO 5
6.	Interpret about serial communication in 8051 microcontroller.	Understand	The learner to <b>Recall</b> the types of communication and <b>Understand</b> about serial communication and its standards and <b>Explain</b> why it is preferred	CO 7
7.	Explain mode 2 of serial communication in 8051 microcontroller.	Understand	The learner to <b>Recall</b> the types of communication and <b>Understand</b> about serial communication and its standards and <b>Explain about</b> mode 2 with respect to baud rate	CO 7
8.	Compare mode 1, mode 3 of timer operation with their applications.	Understand	The learner to <b>Understand</b> about Timers and their modes and <b>Explain</b> which mode is suitable for applications	CO 8
9.	Describe mode 0 of serial communication in 8051 microcontroller.	Understand	The learner to <b>Recall</b> the types of communication and <b>Understand</b> about serial communication and its standards and <b>Explain</b> about mode 0 with respect to baud rate	CO 7

10.	Explore how communication at variable baud rates can be done in 8051 microcontroller.	Understand	The learner to <b>Recall</b> the types of communication and <b>Understand</b> about serial communication and its standards and <b>Explain</b> about mode 0, mode1, mode 2, mode3 with respect to baud rate	CO 7
11.	How interrupts are handled in 8051 microcontroller corresponding with SFR's.	Understand	The learner to <b>Recall</b> what is Interrupt and <b>Understand</b> Interrupt handling mechanism and <b>Explain</b> how the interrupts will be handled by special function registers	CO 5
12.	Explain the following important operational features of 8051 in detail. i) PSW ii) TMOD iii) TCON iv) SCON	Understand	The learner to <b>Recall</b> 8051 microcontroller memory organization <b>and Understand</b> about Special function Registers and then <b>Explain</b> how to program and control different hardware peripherals	CO 9
13.	What is key bouncing and Explain how keyboard is interfaced with 8051 microcontroller with neat sketch.	Apply	The learner to <b>Understand</b> about keyboard and microcontroller then <b>Explain</b> with a diagram how to <b>Construct</b> an interfacing between them	CO 9
14.	Demonstrate how a digital to analog converter is interfaced with 8051 microcontroller with neat schematic.	Apply	The learner to <b>Understand</b> about DAC and microcontroller then <b>Explain</b> with a diagram how to <b>Construct</b> an interfacing between them	CO 9
15.	How communication at variable baud rates can be done in 8051 microcontroller. Explain.	Understand	The learner to <b>Recall</b> the types of communication and <b>Understand</b> about serial communication and its standards and <b>Explain</b> about mode 0, mode1, mode 2, mode3 with respect to baud rate	CO 7
16.	Illustrate about mode 0 of serial communication in 8051 microcontroller.	Understand	The learner to <b>Recall</b> the types of communication and <b>Understand</b> about serial communication and its standards and <b>Explain about</b> mode 0 with respect to baud rate	CO 7
17.	How to interface 8051 microcontroller with ADC Explain with schematic.	Apply	The learner to <b>Understand</b> about ADC and microcontroller then <b>Explain</b> with a diagram how to <b>Construct</b> an interfacing between them	CO 9
18.	Compare timer & counter? Analyze the 16-bit timer mode and 8-bit auto-reload mode of 8051 microcontroller.	Understand	The learner to <b>identify</b> the difference between timers and counters <b>Understand</b> about Special Function Registers of 8051 microcontroller.	CO 8



19.	Explain the operation of TCON & PCON registers in 8051 with an example.	Understand	The learner to <b>Recall</b> 8051 microcontroller memory organization <b>and Understand</b> about Special function Registers and then <b>Explain</b> how to program and control different hardware peripherals	CO 9
20.	How to interface an LCD display With microcontroller. Explain with neat sketch.	Apply	The learner to <b>Understand</b> about LCD display and microcontroller then <b>Explain</b> with a diagram how to <b>Construct</b> an interfacing between them	CO 9
<b>Part - C (Analytical Questions)</b>				
1.	Develop a program to make the stepper motor to rotate in clockwise direction using 8051 microcontroller.	Apply	The learner to <b>Understand</b> instruction set and addressing modes, <b>develop</b> an assembly language Program to rotate stepper motor in clock wise direction by <b>applying</b> interfacing between stepper motor and 8051 microcontroller	CO 3 ,CO 9
2.	Explain how to interface a keyboard with microcontroller with a neat diagram and tell how microcontroller recognizes the key-press.	Understand	The learner to <b>Understand</b> how to interface keyboard with 8051 microcontroller and then <b>explain</b> how key press is identified	CO 9
3.	Develop a program to make the stepper motor to rotate in anti-clockwise direction using 8051 microcontroller.	Apply	The learner to <b>Understand</b> instruction set and addressing modes, <b>develop</b> an assembly language Program to rotate stepper motor in anti-clock wise direction by <b>applying</b> interfacing between stepper motor and 8051 microcontroller	CO 3 ,CO 9
4.	Develop an ALP to generate triangular waveform forms using 8051 microcontroller	Apply	The learner to <b>Understand</b> instruction set and addressing modes, <b>develop</b> an assembly language Program to generate the triangular wave by <b>applying</b> interfacing between D/A converter and 8051 microcontroller.	CO 3 ,CO 9
5.	How to Program the on-chip timer in 8051 to be an event counter. Use model and display the binary count on P1. Set the initial count to be Zero.	Understand	The learner to <b>Understand</b> how to program on-chip timer in 8051 microcontroller with given conditions	CO 8
6.	Develop an Assembly Language Program to generate square wave by Interfacing DAC 08 using 8051 microcontroller.	Apply	The learner to <b>Understand</b> instruction set and addressing modes, <b>develop</b> an assembly language Program to generate the square wave by <b>applying</b> interfacing between D/A converter and 8051 microcontroller.	CO 3 ,CO 9
7.	Develop an ALP to generate saw tooth wave forms using 8051 microcontroller	Apply	The learner to <b>Understand</b> instruction set and addressing modes, <b>develop</b> an assembly	CO 3 ,CO 9

			language Program to generate the saw tooth wave by <b>applying</b> interfacing between D/A converter and 8051 microcontroller.	
8.	Develop a program to generate 2 kHz square wave form at port 1.0 of 8051.	Apply	The learner to <b>Understand</b> instruction set and addressing modes, <b>develop</b> an assembly language Program to generate the square wave for given frequency by <b>applying</b> interfacing between D/A converter and port 1.0 of 8051 microcontroller.	CO 3 ,CO 9
9.	Demonstrate how to transfer the message “ LBRCE” serially at 4800 baud rate in mode 1( 8 bit UART) in 8051.	Understand	The learner to <b>Understand</b> instruction set and addressing modes, <b>Understand</b> how to transfer data serially with given baud rate in different modes of 8051 microcontroller	CO 3 ,CO 9
10.	Develop a program to generate 4kHz square wave form at port 1.0 of 8051.	Apply	The learner to <b>Understand</b> instruction set and addressing modes, <b>develop</b> an assembly language Program to generate the square wave for given frequency by <b>applying</b> interfacing between D/A converter and port 1.0 of 8051 microcontroller.	CO 3 ,CO 9

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