SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

VI SEMESTER

1906601 – MICROPROCESSORS AND MICROCONTROLLERS

(Common to ECE and Medical Electronics)

Regulation – 2019

Academic Year 2024 – 2025 (Even Semester)

Prepared by

Dr. G. UDHAYAKUMAR, Professor / ECE

Dr. S. R. PREETHI, Associate Professor / ECE

Dr. K. DURGADEVI, AP/ECE

UNIT I - THE 8086 MICROPROCESSOR

Introduction to 8086 – Microprocessor architecture – Register and Memory Organization - 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.

PART - A

Q.No.	Questions	Course Outcomes	BT Level	Competence
1.	List out the functional parts of 8086 CPU?	CO1	BTL1	Remembering
2.	Define pointers and index registers?	CO1	BTL1	Remembering
3.	Differentiate between Macro and Subroutine.	CO1	BTL2	Understanding
4.	Name the different types of interrupts supported by 8086.	CO1	BTL1	Remembering
5.	List the flags present in the 8086 processor.	CO1	BLT1	Remembering
6.	What is meant by pipelining?	CO1	BTL1	Remembering
7.	Discuss about interrupt service routine?	CO1	BTL1	Remembering
8.	Write down the addressing mode of the instruction MOV AX, 55H [BX] [SI].	CO1	BTL2	Understanding
9.	Calculate the physical address, when segment address is 1085H and effective address is 4537H.	CO1	BTL2	Understanding
10.	Mention the instructions used for BCD arithmetic in 8086.	CO1	BTL1	Remembering
11.	Classify the machine control instructions available in 8086.	CO1	BTL2	Understanding
12.	Define assembler.	CO1	BTL1	Remembering
13.	Show how the 2 byte INT instruction can be applied for debugging.	CO1	BTL2	Understanding
14.	How would you use carry and zero flags that reflect the result of the instruction CMP BX, CX?	CO1	BTL2	Understanding
15.	List out the purpose of segment registers in 8086?	CO1	BTL1	Remembering
16.	The offset address of data is 341BH and the data segment value is 123AH. Generate the physical address of the data.	CO1	BTL2	Understanding
17.	Write the interrupt priorities of 8086.	CO1	BTL1	Remembering
18.	Mention the need for modular programming.	CO1	BTL1	Remembering
19.	Specify the maximum memory size that can be addressed by the 8086 Processor?	CO1	BTL2	Understanding
20.	What is meant by assembler directive?	CO1	BTL1	Remembering
21.	Outline the difference between the instructions MOV AX, 2437H and MOV AX, [2437H].	CO1	BTL2	Understanding
22.	Compare CALL and PUSH instruction.	CO1	BTL2	Understanding
23.	What are the advantages of using the MOVS and CMPS instructions over the MOV and CMP instructions while working with strings?	CO1	BTL2	Understanding
24.	If a data segment begins at address 2400H, what is the address of the last location in the segment?	CO1	BTL2	Understanding

PART - B

Q.No.		Questions		Course Outcomes	BT Level	Competence
1.		With neat illustration, explain in detail the internal architecture and the function of 8086 Microprocessor.	(13)	CO1	BTL4	Analyzing

2.		Write an 8086 ALP to convert BCD data to Binary data.	(13)	CO1	BTL3	Applying
3.	(i)	What is meant by stack?	(3)	CO1	BTL3	Applying
	(ii)	Enumerate the operation of stack in 8086 Microprocessor using PUSH and POP instructions.	(10)	CO1	BTL3	Applying
4.	(i)	Define addressing mode	(3)	CO1	BTL3	Applying
	(ii)	Explain any 5 addressing mode with an example.	(10)	CO1	BTL3	Applying
5.		State the advantages of modular programming and illustrate the process by which the modules assembled separately are linked together and programs are prepared for execution.	(13)	CO1	BTL4	Analyzing
6.		Express the categories under which the instructions in the instruction set of the 8086 microprocessor are grouped. Examine the operation of any two instructions in each group.	(13)	CO1	BTL4	Analyzing
7.	(i)	Analyze the function of unsigned division instructions in 8086 with suitable examples.	(7)	CO1	BTL4	Analyzing
	(ii)	Categorize the function of various flags of 8086 processor.	(6)	CO1	BTL4	Analyzing
8.		Write briefly about interrupts and its types. Explain the control flow of the microprocessor in detail when interrupt occurs.	(13)	CO1	BTL4	Analyzing
9.		Write an assembly language program to search data in an array using 8086 instruction set.	(13)	CO1	BTL3	Applying
10		Classify the 8086 string manipulation and give detailed explanation with appropriate examples.	(13)	CO1	BTL4	Analyzing
11.		Describe the register and memory organization of the 8086 microprocessor.	(13)	CO1	BTL4	Analyzing
12.		Explain the data transfer group and logical group of 8086 instructions with necessary examples	(13)	CO1	BTL4	Analyzing
13.	(i)	Find the status of the CF and ZF flags after the execution of each of the following set of instructions. Given the AX = 4160 H i. ADD AX, 9034 H ii. CMP AX, 0B08 H iii. XOR AL, AL iv. MOV AL, 34 H	(8)	CO1	BTL3	Applying
	(ii)	Write a program for 8086 Microprocessor that add two bytes and stores the result in memory.	(5)	CO1	BTL3	Applying
14.		Give detailed note about the following terms: Procedures and Macros.	(13)	CO1	BTL4	Analyzing
15.		List the functional units and describe their functions in BIU and EU of 8086.	(13)	CO1	BTL4	Analyzing
16.	(i)	Distinguish between call and subroutine.	(5)	CO1	BTL4	Analyzing
	(ii)	Analyze the following 8086 instructions with data LAHF, RCL, ROL and SAHF	(8)	CO1	BTL4	Analyzing
17.		With the help of an algorithm, write an assembly language program to sort an array of ‘10’ elements in descending order.	(13)	CO1	BTL3	Applying

PART – C						
1.	(i)	Develop a program to transfer 50 bytes of data from memory location starting from 2000H to 3000H using the string instruction MOVSB.	(8)	CO1	BTL3	Applying
	(ii)	Write an ALP to compute multiplication of two 16 bit numbers using 8086 instruction set.	(7)	CO1	BTL3	Applying
2.		Explain in detail with appropriate examples the classification of instruction set in 8086 Microprocessor	(15)	CO1	BTL4	Analyzing
3.	(i)	Write an 8086 ALP to find the sum of numbers in an array of 10 elements.	(8)	CO1	BTL3	Applying
	(ii)	Write an 8086 ALP to find the largest number in an array.	(7)	CO1	BTL3	Applying
4.		Explain the various assembler directives used in 8086 Microprocessor with suitable examples.	(15)	CO1	BTL4	Analyzing
5.		Discuss all the addressing modes of 8086. Use relevant examples for each case	(15)	CO1	BTL4	Analyzing

UNIT II - 8086 SYSTEM BUS STRUCTURE				
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.				
PART - A				
Q.No.	**Questions**	**Course Outcomes**	**BT Level**	**Competence**
1.	Define Bus.	CO2	BTL1	Remembering
2.	Name the two different modes of operation used in 8086.	CO2	BTL1	Remembering
3.	Distinguish the LOCK and TEST signal?	CO2	BTL2	Understanding
4.	Define the term ‘ Multiprogramming’	CO2	BTL1	Remembering
5.	Explore the function of QS_1 and QS_0.	CO2	BTL1	Remembering
6.	Draw the timing diagram of Interrupt acknowledgement on a minimum mode system.	CO2	BTL2	Understanding
7.	Examine the signals used by 8086 to demultiplex the address/data and to control the data bus	CO2	BTL2	Understanding
8.	Why is the 8086 memory divided into odd and even banks?	CO2	BTL2	Understanding
9.	Discriminate the minimum mode and maximum mode of operation.	CO2	BTL2	Understanding
10.	Illustrate the stages of pipelining.	CO2	BTL1	Remembering
11.	Name the various advanced microprocessors.	CO2	BTL1	Remembering
12.	How is a clock signal generated in 8086?	CO2	BTL2	Understanding
13.	List the advantages of multiprocessor configurations.	CO2	BTL2	Understanding
14.	What is the function of the BHE signal in 8086?	CO2	BTL1	Remembering
15.	Mention the need for a co-processor.	CO2	BTL1	Remembering
16.	Write the various bus allocation schemes in multiprocessor configurations.	CO2	BTL1	Remembering
17.	How does the main processor distinguish its instructions from the	CO2	BTL2	Understanding

	co-processor instructions when it fetches the instructions from memory?			
18.	Differentiate the closely and loosely coupled configurations	CO2	BTL2	Understanding
19.	What is the function of MN/MX pin ?	CO2	BTL1	Remembering
20.	Using 8086 and 8087, draw a coprocessor configuration with relevant signals.	CO2	BTL2	Understanding
21.	Draw the bus request and bus grant timings in minimum mode system.	CO2	BTL2	Understanding
22.	Which pins of 8086 are used to indicate the type of transfer in minimum mode?	CO2	BTL1	Remembering
23.	Write briefly on the system bus operation of 8086.	CO2	BTL1	Remembering
24.	Compare Processor and Coprocessor.	CO2	BTL2	Understanding

PART - B

Q.No.		Questions		Course Outcomes	BT Level	Competence
1.		Draw the pin diagram of 8086 processor and explain all the signals.	(13)	CO2	BTL3	Applying
2.		Discuss about the 8086 based minimum mode system with a neat diagram.	(13)	CO2	BTL3	Applying
3.		Draw the timing diagram for Read and write cycle in minimum mode operation and explain.	(13)	CO2	BTL3	Applying
4.		Explain the operations of I/O programming in detail.	(13)	CO2	BTL3	Applying
5.		Explain the closely coupled configuration of the multiprocessor system with a suitable diagram	(13)	CO2	BTL3	Applying
6.	(i)	What are the problems that are to be considered in designing a multiprocessor system?	(7)	CO2	BTL4	Analyzing
	(ii)	What are the techniques for reducing contentions?	(6)	CO2	BTL4	Analyzing
7.		With the help of timing diagram, explain the Read and Write cycle in maximum mode operation of the 8086 microprocessor.	(13)	CO2	BTL3	Applying
8.	(i)	Distinguish between loosely coupled and closely coupled multiprocessor systems	(6)	CO2	BTL4	Analyzing
	(ii)	Differentiate Maximum mode from minimum mode of 8086.	(7)	CO2	BTL4	Analyzing
9.		Explain how coprocessor is interfaced with CPU and synchronized.	(13)	CO2	BTL3	Applying
10		Describe the loosely coupled configuration with a neat diagram.	(13)	CO2	BTL3	Applying
11.		Discuss about the signals that are specific to minimum mode operation?	(13)	CO2	BTL4	Analyzing
12.		Discuss the hardware enhancements of 80186 and 80286 microprocessors compared to 8086.	(13)	CO2	BTL4	Analyzing
13.		Explain the basic bus access control and arbitration schemes used in loosely coupled multiprocessor system.	(13)	CO2	BTL4	Analyzing
14.		Explain multiprogramming by comparing with multiprocessing.	(13)	CO2	BTL4	Analyzing

15.		Enumerate I/O programming by its major input and output operation	(13)	CO2	BTL4	Analyzing
16.		Describe the maximum mode configuration of 8086 with a neat diagram. Mention the functions of various signals	(13)	CO2	BTL3	Applying
17.		How did the CPU interact with the independent processor in a closely coupled configuration? Support your answer with a flowchart.	(13)	CO2	BTL4	Analyzing
PART – C						
1.		Examine the effectiveness of the minimum mode and maximum mode of operations in 8086 in detail.	(15)	CO2	BTL4	Analyzing
2.		Design an 8086 based system for the following specifications (i) 8086 in Minimum mode (ii) 4K ROM (iii)128 RAM Draw the complete schematic of the design indicating the address map.	(15)	CO2	BTL3	Applying
3.		With the help of a neat sketch, describe the interconnection of a coprocessor 8087 with 8086	(15)	CO2	BTL3	Applying
4.		With necessary illustrations write the pipelining process of 80486.	(15)	CO2	BTL3	Applying
5.		Discuss the signals in interfacing the bus controller with 8086 microprocessor in maximum mode.	(15)	CO2	BTL4	Analyzing

UNIT III - I/O INTERFACING

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display, LCD display, Keyboard display interface and Alarm Controller.

PART - A

Q.No.	Questions	Course Outcomes	BT Level	Competence
1.	State the advantage and disadvantage of parallel communication over serial communication.	CO3	BTL2	Understanding
2.	Define the terms A/D & D/A convertor.	CO3	BTL1	Remembering
3.	List the four display modes of 8279 keyboard and display controller	CO3	BTL1	Remembering
4.	What are the applications of programmable interval timer?	CO3	BTL1	Remembering
5.	Specify the different types of peripheral interfacing used in 8086.	CO3	BTL1	Remembering
6.	Write the various modes of 8254 timer.	CO3	BTL1	Remembering
7.	How are the functional types defined in control word of 8251?	CO3	BTL1	Remembering
8.	Formulate the frequency transmit clock (TxC) required by an 8251 in order to transmit data at 4800 Baud with a Baud rate factor of 16?	CO3	BTL2	Understanding
9.	Point out the modes used by the DMA processor to transfer data.	CO3	BTL1	Remembering
10.	What is meant by key bouncing?	CO3	BTL1	Remembering
11.	How would you use the terminal count register?	CO3	BTL2	Understanding
12.	Give the different types of command words used in 8259A.	CO3	BTL1	Remembering

13.	Mention the applications of 8251 IC chip?	CO3	BTL1	Remembering
14.	Find the necessity of handshake signals in mode-2 configurations of 8255.	CO3	BTL2	Understanding
15.	Discuss the features of mode 1 used in 8255?	CO3	BTL2	Understanding
16.	Configure the control word for the following specifications of 8255, In mode 0 operation, Ports A and B are input ports and C is an output port.	CO3	BTL2	Understanding
17.	Evaluate the value of ICW4 such that the 8259 is configured for use in an 8086 system, with normal EOI, buffered-mode master, and special fully nested-mode disabled.	CO3	BTL2	Understanding
18.	Analyze the priority scheme for OCW_2 equals 67_{16}?	CO3	BTL2	Understanding
19.	What is the purpose of control word used in 8255?	CO3	BTL1	Remembering
20.	Identify the address lines and data lines for accessing 32K x 8 memory?	CO3	BTL2	Understanding
21.	What is the need for interfacing?	CO3	BTL1	Remembering
22.	Why program controlled I/O is unsuitable for high speed data transfer?	CO3	BTL2	Understanding
23.	Calculate the resolution of an 8-bit A/D converter assuming the voltage range of the input as -10V to +10V.	CO3	BTL2	Understanding
24.	What is the internal operating frequency of 8279? How can you derive it from any available clock signal?	CO3	BTL2	Understanding

PART - B

Q.No.		Questions		Course Outcomes	BT Level	Competence
1.		Explain in detail with block diagram, the constructional features and functions of the 8259 interrupt controller.	(13)	CO3	BTL4	Analyzing
2.		Describe the 8255 programmable peripheral interface and its operating modes	(13)	CO3	BTL4	Analyzing
3.		With a neat diagram and explain in detail the internal architecture of 8279 keyboard and display controller and its various mode of operations.	(13)	CO3	BTL4	Analyzing
4.		Discuss how microprocessors are interfaced with I/O and memory in detail	(13)	CO3	BTL4	Analyzing
5.		Enumerate the internal architectural diagram of the 8237 and explain how it functions as a DMA controller.	(13)	CO3	BTL4	Analyzing
6.		Pointout the features and explain the operation of 8254 Programmable Interval Timer with diagram, and also explain the various modes of operation	(13)	CO3	BTL4	Analyzing
7.		With neat illustrations, explain the internal architecture and also discuss Command instruction and Status register format of 8251 serial communication.	(13)	CO3	BTL4	Analyzing
8.		Draw a circuit diagram to interface a keyboard and a seven segment LED using 8279	(13)	CO3	BTL3	Applying
9.	(i)	Illustrate how to interface an LCD display with an 8086 microprocessor.	(7)	CO3	BTL3	Applying

	(ii)	Write a program to display a character using an LCD display	(6)	CO3	BTL3	Applying
10.		Choose an integrated chip to be used for Analog to Digital conversion and explain how it is interfaced with the 8086 processor	(13)	CO3	BTL3	Applying
11.		Design the steps for interfacing an alarm controller with an 8086 microprocessor with a diagram and explain in detail	(13)	CO3	BTL4	Analyzing
12.		Configure the master slave connection between two 8259 using 8086 processor with neat diagram	(13)	CO3	BTL3	Applying
13.	(i)	Write the differences between memory mapped I/O and peripheral mapped I/O.	(5)	CO3	BTL4	Analyzing
	(ii)	Why is DAC required? Explain DAC interface with diagram	(8)	CO3	BTL4	Analyzing
14.	(i)	Distinguish between Programmed I/O and Interrupt Driven I/O	(5)	CO3	BTL4	Analyzing
	(ii)	Compare the different Modes of operation of 8253/8254 timer	(8)	CO3	BTL4	Analyzing
15.		Discuss how 8257 is interfaced with 8086 and also explain the various register formats.	(13)	CO3	BTL3	Applying
16.		Draw a circuit diagram to interface 8251 with 8086 and explain.	(13)	CO3	BTL3	Applying
17.		Describe the operating modes and control words of Programmable Peripheral Interface (8255). Also specify the handshaking signals and their functions if port A of 8255 is setup as input port in mode 1.	(13)	CO3	BTL3	Applying
PART - C						
1.		Design a traffic light control system using 8086 microprocessor interface diagram and Write ALP for the same.	(15)	CO3	BTL4	Analyzing
2.		Interface eight 7 segment LED (common cathode) to 8086 through 8279 and write an 8086 ALP to display 1 to 8.	(15)	CO3	BTL3	Applying
3.	(i)	Design the control word of the 8255 with:				
		(a) All ports as input ports	(3)	CO3	BTL3	Applying
		(b) Port A and B as input and port C as output	(4)	CO3	BTL3	Applying
	(ii)	With a 5MHz clock, write a program to get a symmetric square wave from port B of the 8255.	(8)	CO3	BTL3	Applying
4.		Draw the complete interfacing diagram for interfacing an 8-bit channel A/D Converter like ADC 0808/0809 to an 8086 CPU. Test a sample, one at a time from each channel of analog inputs and display it at a special display port & wait for 2 seconds for each channel.	(15)	CO3	BTL4	Analyzing
5.		Configure the connection between 12 bit DAC and 8086 with necessary interfacing diagram and write program to generate triangular waveform of period 10ms for CPU runs at 5MHz clock frequency.	(15)	CO3	BTL4	Analyzing

UNIT IV - MICROCONTROLLER				
Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins- Ports and Circuits - Instruction set - Addressing modes - Timers - Serial Port - Interrupts - Assembly language programming.				
PART - A				
Q.No.	**Questions**	**Course Outcomes**	**BT Level**	**Competence**
1.	What are the features of 8051 microcontroller?	CO4	BTL1	Remembering
2.	Write a program to mask the 0^{th} and 7^{th} bit using 8051.	CO4	BTL2	Understanding
3.	List the counters available in 8051.	CO4	BTL1	Remembering
4.	How the selection of a particular register bank is done in 8051?	CO4	BTL2	Understanding
5.	Which ports of 8051 are bit addressable?	CO4	BTL2	Understanding
6.	What is the difference between the LJMP and SJMP instructions of 8051?	CO4	BTL2	Understanding
7.	Mention the significance of the GATE bit in the TMOD control register?	CO4	BTL1	Remembering
8.	What happens in power down mode of 8051 Microcontroller?	CO4	BTL1	Remembering
9.	What is the role of SBUF in serial communication in 8051?	CO4	BTL1	Remembering
10.	Write a program to find the 2's complement using 8051.	CO4	BTL2	Understanding
11.	What is meant by PSW in 8051?	CO4	BTL1	Remembering
12.	Outline the function of CJNE, DJNZ instruction.	CO4	BTL2	Understanding
13.	Identify the port used as multifunction port and list the signals.	CO4	BTL2	Understanding
14.	Give two example of bit manipulation instructions?	CO4	BTL1	Remembering
15.	Distinguish between microprocessor & microcontroller.	CO4	BTL2	Understanding
16.	How do you place a specific value in the DPTR register?	CO4	BTL1	Remembering
17.	What are the limitations involved in the serial data buffer of 8051?	CO4	BTL2	Understanding
18.	Define addressing mode and list the types.	CO4	BTL1	Remembering
19.	Write the serial port interrupts of 8051.	CO4	BTL1	Remembering
20.	Specify the single instruction, which clears the most significant bit of B register 8051, without affecting remaining bits.	CO4	BTL2	Understanding
21.	Perform the following operations using bit addressable instructions: Start Timer 1, Stop Timer 0	CO4	BTL2	Understanding
22.	Which of the 8051 ports need pull-up registers to functions as an I/O port?	CO4	BTL1	Remembering
23.	Why do 55H and AAH is used to test the ports of 8051.	CO4	BTL2	Understanding
24.	Draw the bit addressable format of TCON register.	CO4	BTL1	Remembering

PART - B						
Q.No.		**Questions**		**Course Outcomes**	**BT Level**	**Competence**
1.		Discuss in detail about the instruction sets of 8051 microcontroller.	(13)	CO4	BTL4	Analyzing
2.		Illustrate the architectural features of 8051 microcontroller with necessary diagram.	(13)	CO4	BTL4	Analyzing
3.		Describe interrupts and interrupt programming with respect to 8051 microcontroller with neat diagram.	(13)	CO4	BTL4	Analyzing

4.		Discuss in brief the various registers present in 8051 microcontroller.	(13)	CO4	BTL4	Analyzing
5.		Analyze the internal RAM structure and SFR memory of 8051.	(13)	CO4	BTL4	Analyzing
6.	(i)	Explain in detail about arithmetic and control instruction set in 8051.	(7)	CO4	BTL3	Applying
	(ii)	Write a program to add any two 16-bit data using 8051.	(6)	CO4	BTL3	Applying
7.	(i)	With neat diagram explain port 1 pin configurations.	(6)	CO4	BTL3	Applying
	(ii)	Draw the bit pattern of program status word of 8051 and explain the significance of each bit with examples.	(7)	CO4	BTL3	Applying
8.		Illustrate the internal memory organization of 8051 microcontroller.	(13)	CO4	BTL4	Analyzing
9.		Classify the different addressing modes in 8051 microcontroller with an example.	(13)	CO4	BTL4	Analyzing
10	(i)	Name the four ports of 8051 and state the difference between them.	(5)	CO4	BTL3	Applying
	(ii)	Describe the following 8051 instructions with suitable example: DA, MUL, SWAP and SJMP	(8)	CO4	BTL3	Applying
11.		Write short notes on TCON and SCON registers with necessary diagram.	(13)	CO4	BTL3	Applying
12.		Examine the function of 8051 microcontroller instructions for performing data transfer and logical operations with suitable examples.	(13)	CO4	BTL4	Analyzing
13.	(i)	Name some SFR's in 8051and explain in detail.	(5)	CO4	BTL3	Applying
	(ii)	Write an ALP in 8051 to convert a 16 bit binary number to ASCII.	(8)	CO4	BTL3	Applying
14.	(i)	Write the program to find square of a number using 8051 instruction set?	(7)	CO4	BTL3	Applying
	(ii)	Write an 8051 ALP to multiply two numbers are 45H and 9AH.	(6)	CO4	BTL3	Applying
15.		Summarize the various types and functions of I/O ports with necessary diagrams	(13)	CO4	BTL4	Analyzing
16.		List the external hardware interrupts of 8051. Explain how they are activated.	(13)	CO4	BTL4	Analyzing
17.		Draw the register format of IE and IP registers of 8051 and explain in detail.	(13)	CO4	BTL3	Applying
PART - C						
1.		Briefly illustrate the internal port structure of 8051 microcontroller	(15)	CO4	BTL4	Analyzing
2.		Two 8051s are interfaced for full-duplex communication. Assuming the crystal frequency of both to be 11.0592 MHz, develop the software necessary for serial communication with a baud rate of 4800	(15)	CO4	BTL3	Applying
3.	(i)	Write a brief note on external data move operations in 8051	(7)	CO4	BTL3	Applying
	(ii)	Write an 8051 ALP to add three BCD numbers stored in internal RAM locations 25H, 26H and 27H and put	(8)	CO4	BTL3	Applying

		the result in RAM locations 31H (MSB) and 30H (LSB). Use Register R0 to store the intermediate result.				
4.		An array of 20 numbers is stored in the internal data RAM starting from the location 40H. Write a program to				
	(i)	Sort the array in ascending order.	(10)	CO4	BTL3	Applying
	(ii)	Modify the above program for sorting in descending order	(5)	CO4	BTL3	Applying
5.		Summarize the various modes of 8051 timers with their associated registers.	(15)	CO4	BTL4	Analyzing

UNIT V - INTERFACING MICROCONTROLLER

LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor, Traffic Light Control and Waveform generation. Comparison of Microprocessor, Microcontroller, PIC and ARM processors

PART - A

Q.No.	Questions	Course Outcomes	BT Level	Competence
1.	List the types of sensors used for interfacing?	CO5	BTL1	Remembering
2.	Write the types of ADC?	CO5	BTL1	Remembering
3.	What is the necessity to interface DAC with microcontroller?	CO5	BTL2	Understanding
4.	How to change the stepper motor direction?	CO5	BTL2	Understanding
5.	Conclude the features of ARM Processor.	CO5	BTL1	Remembering
6.	List the types of address decoding in accessing external memory?	CO5	BTL1	Remembering
7.	How the stepper motor is interfaced with 8051.	CO5	BTL1	Remembering
8.	Under which condition 8051 with internal 4K program memory would access external program memory?	CO5	BTL2	Understanding
9.	Identify the usage of the following instruction MOVC A, @A + DPTR.	CO5	BTL2	Understanding
10.	How many machine cycles are necessary for MOVX instruction to read a byte from external data memory?	CO5	BTL1	Remembering
11.	Sketch the ADC interfaced with 8051.	CO5	BTL1	Remembering
12.	Differentiate between the LED and LCD display			
13.	What is the need for RS pin in an LCD?	CO5	BTL1	Remembering
14.	Mention the applications of microcontroller.	CO5	BTL1	Remembering
15.	Examine square wave signal be given to drive segment lines of LCD display?	CO5	BTL2	Understanding
16.	How does the status of EA pin affect the access to internal and external program memory?	CO5	BTL2	Understanding
17.	How does 8051 differentiate between the external and internal program memory?	CO5	BTL2	Understanding
18.	Name the important electrical properties of IC1408.	CO5	BTL1	Remembering
19.	What is the need to use a driver IC to interface stepper motor with 8051 microcontroller?	CO5	BTL2	Understanding
20.	Draw the waveform for external data memory data cycle.	CO5	BTL1	Remembering

21.	What is meant by Harvard architecture?	CO5	BTL1	Remembering
22.	Point out the difference between ARM and PIC?	CO5	BTL2	Understanding
23.	How many ports are there for PIC and ARM?	CO5	BTL2	Understanding
24.	Write the program and data memory size of PIC microcontroller?	CO5	BTL2	Understanding

PART - B						
Q.No.	**Questions**			**Course Outcomes**	**BT Level**	**Competence**
1.		What are the instructions to access external data memory? Discuss in detail.	(13)	CO5	BTL4	Analyzing
2.		Write a program to scan a small keyboard consisting of 8 keys and identify a key pressed?	(13)	CO5	BTL3	Applying
3.	(i)	Illustrate how to interface an LCD display with µC.	(7)	CO5	BTL3	Applying
	(ii)	Demonstrate a program to display a character using an LCD display.	(6)	CO5	BTL3	Applying
4.		Assuming XTAL= 11.0592 MHz, write an 8051 ALP to generate a square wave of 50 Hz frequency on pin P2.3.	(13)	CO5	BTL3	Applying
5.		Describe the address decoding techniques to access external memory in 8051 microcontroller.	(13)	CO5	BTL4	Analyzing
6.		Write a Program using 8051 to display “Engineer” on LCD on size 8 x 1 Line.	(13)	CO5	BTL3	Applying
7.		Develop a program to convert the analog signal in channel 0 of ADC 0809 and store it in location 30H onwards. The routine should store the value whenever it is called.	(13)	CO5	BTL3	Applying
8.		A 8051 based system requires external memory of four 4 Kbytes of SRAM each and two chips of EPROM of size 2 Kbytes. The EPROM starts at address 2000H. The SRAM address map follows EPROM map. Give the complete interface.	(13)	CO5	BTL3	Applying
9.		Explain the interfacing of external program memory with its timing diagram.	(13)	CO5	BTL4	Analyzing
10		With a neat circuit diagram, explain how 4x4 Keypad is in interfaced with 8051 microcontroller and write 8051 ALP for keypad scanning.	(13)	CO5	BTL3	Applying
11.		Compare Microprocessor, Microcontroller, PIC and ARM Processors.	(13)	CO5	BTL4	Analyzing
12.		Describe the procedures required to interface an 8 bit ADC with 8051 microcontroller.	(13)	CO5	BTL4	Analyzing
13.		Write assembly language program to generate a triangular waveform at the output of DAC by interfacing it with 8051 microcontroller.	(13)	CO5	BTL3	Applying
14.		Write an 8051 ALP to create a square wave of 66% duty cycle on bit 3 of port 1.	(13)	CO5	BTL3	Applying
15.		Draw the circuit diagram showing the interface of a DAC with microcontroller and explain.	(13)	CO5	BTL4	Analyzing
16.		Draw and Explain the general block diagram of ARM	(13)	CO5	BTL4	Analyzing

		processor.				
17.		Write an assembly language program to generate a sine waveform at the output of DAC by interfacing it with 8051 microcontroller.	(13)	CO5	BTL3	Applying
PART - C						
1.		Write the interfacing of a 8051 based traffic light control system with necessary diagram.	(15)	CO5	BTL4	Analyzing
2.		Interface 8 bit, 8 channel ADC to 8051, Write an ALP to convert Sensor data from various input devices through CH0, CH3 and CH7 channel to digital data and store them in external memory location starting from C000H, Repeat procedure for every 1 sec.	(15)	CO5	BTL4	Analyzing
3.		Draw the diagram to interface a stepper motor with 8051 microcontroller and explain. Write its ALP to run the stepper motor in both forward and reverse direction with delay.	(15)	CO5	BTL4	Analyzing
4.		Sixteen keys are to be interfaced with 8051 arranged in a 4 x 4 matrix. Give a schematic of the hardware interfacing. Develop a software to generate unique key code for any key pressed. The key code must be fully de bounced.	(15)	CO5	BTL3	Applying
5.		Write short notes on following:				
	(i)	PIC Controller.	(7)	CO5	BTL3	Applying
	(ii)	Sensor interfacing.	(8)	CO5	BTL3	Applying