MICROPROCESSORS AND MICROCONTROLLER
(AEIE 2205)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

    (i)   PSW in 8085 microprocessor is
            (a) 8 bits   (b) 16 bit   (c) 4 bits   (d) 32 bit.

    (ii)   Using 8085 instruction, if after execution of ANA logical operation, the result
            00H is stored in the accumulator. Now flag register content will be
            (a) 04_H (b) 54_H (c) 50_H (d) nothing changed.

    (iii)   What is the vector location for INT2 interrupt?
            (a) 0006H   (b) 0010H   (c) 0008H   (d) 0013H.

    (iv)   Execution of the LOOP instruction of 8086 microprocessor will continue until
            (a) CX=0   (b) CH=0   (c) AX=0   (d) CL=0.

    (v)   In MODE2 operation of 8255, data transfer takes place between
            (a) memory and CPU   (b) CPU and I/O
            (c) I/O and output   (d) different CPU.

    (vi)   In case of 8086 microprocessor, six numbers of byte are stored. It means
            (a) six numbers of instruction
            (b) only six numbers of bytes not the six numbers of instruction
            (c) 3 numbers of instruction
            (d) none of these.

    (vii)   How many of extra signals are needed to configure min or max mode in addition
            to common signals in 8086 microprocessor
            (a) 2   (b) 6   (c) 8   (d) 10.

    (viii) The PIC16F877 operates in _____ addressing modes.
            (a) 2   (b) 3   (c) 4   (d) 5

(ix)   In 8051 microcontroller, index addressing mode represented by the instruction
_____.
(a) MOVC A@A+DPTR   (b) MOVX @DPTR,A
(c) MOVX A@DPTR   (d) MOVX A@R0

(x)   The 8051 microcontroller has
(a) 128 byte on chip RAM & 4KB ROM
(b) 128 byte on chip ROM & 4KB RAM
(c) 4KB on chip RAM & 128 byte ROM
(d) 128 byte on chip RAM & 128 byte ROM.

Group- B

2. (a)   What do you mean by the following instructions of 8085 microprocessor: SHLD F105H, INR M, LDAX B, and DAA (Any three).   [(CO1)(Remember/LOCQ)]
    (b)   Consider $4D_H$, and $C2_H$ are stored in the memory location $A100_H$ and next location. Write down an ALP using 8085 instructions to exchange digit position (like $4D_H$ to $D4_H$) and then ADD two numbers. Finally store the result in next two consecutive memory locations.   [(CO2)(Solve/IOCQ)]
    (c)   Calculate the time required to execute the instruction MVI M, 08 in 8085 Microprocessor with crystal frequency 6 MHz?   [(CO1)(Solve/IOCQ)]
                                                        (2 × 3) + 4 + 2 = 12

3. (a)   Explain the operation of all available interrupts of 8085 μP.
                                                        [(CO1)(Remember/LOCQ)]
    (b)   Specify the content of A, D and flag register status for the following program.
                    MVI A, 4AH
                    MOV D, A
                    SUI 40H
                    STC
                    ANA D
                    HLT   [(CO2)(Analyze/IOCQ)]
                                                        6 + 6 = 12

Group - C

4. (a)   Write down the control word format of 8255 PPI for I/O and BSR mode.
                                                        [(CO5)(Remember/LOCQ)]
    (b)   In MODE- 0 of 8255 PPI, port A (PA) and port C upper (PCU) act as output ports whereas port B (PB) and port C lower (PCL) act as input ports. Hence draw the corresponding interfacing diagram with control word address 83H. Write down the assembly language program to send the data from the input ports PB and PCL to the output ports PA and PCU respectively.   [(CO5)(Design/HOCQ)]
                                                        4 + (4 + 4) = 12

5. (a)   Write an ALP for 8085 microprocessor to store the last two digits of your autonomy roll and registration numbers in memory location $B000_H$ and $B001_H$.

Increment the content of location B000H by 4. Perform XOR operation between the contents of location B000H and B001$_H$ and store the result in memory location B002$_H$. [(CO2)(solve/IOCQ)]

(b) Read the program and answer the following questions:

        MVI B, 0F
        MOV A, B
    Loop: ORA A
        RAL
        JNC Loop
        STA D100$_H$
        HLT

   (i) What is the function of RAL instruction?
  (ii) What is the function of JNC Loop instruction?
 (iii) How many times the Loop will be executed?
 (iv) What is the content of memory location D100$_H$? [(CO2)(Understand/LOCQ)]

(c) Draw the basic block diagram of 8255A. [(CO5)(Remember/LOCQ)]

4 + (1 + 1 + 1 + 1) + 4 = 12

Group - D

6. (a) Draw the register organization of 8086 μP and explain typical applications of each register. [(CO3)(Remember/LOCQ)]

(b) Draw the circuit diagram to interface an ADC with 8086 processor.
[(CO3)(Design/HOCQ)]

(c) Hence write down an ALP to convert analog voltage (0-5V) to a digital (00H-FFH) form for above circuit diagram as in question (b). [(CO3)(Solve/IOCQ)]

4 + 3 + 5 = 12

7. (a) Explain the following addressing modes of 8086 microprocessor with an example-Base addressing, based index addressing, string addressing and machine control addressing. (Any two). [(CO3)(Remember/LOCQ)]

(b) What is the difference between effective (segment and offset) and physical address? Calculate physical address if CS=5000$_H$, IP=0500$_H$.
[(CO3)(Solve/IOCQ)]

(c) Explain the instructions of 8086: CLD, REPZ, CMPSW, and MOVSB (any two).
[(CO3)(Remember/LOCQ)]

(2 + 2) + (2 + 2) + (2 + 2) = 12

Group - E

8. (a) Write a program to blink a LED connected at P1.0 pin of 8051 μC also Draw the necessary circuit diagram. [(CO4)(Design/HOCQ)]

(b) Explain the operation of timer of MODE 1 of 8051 microcontroller.
[(CO4)(Understand/LOCQ)]

(c) How many numbers of instructions in PIC 16F877? Write down the different addressing modes of PIC16F877. [(CO4)(Remember/LOCQ)]

(4 + 2)+ 4 + (1 + 1) = 12

9. (a) Describe the TMOD registers bit significance in 8051Microcontroller.

[(CO4)(Remember/LOCQ)]

(b) How many numbers of I/O ports, addressing modes, and number of instructions are there in 16F877 PIC microcontrollers? [(CO4)(Understand/LOCQ)]

(c) Store 01_H, 02_H, 03_H, and 04_H in register R_0, R_1, R_2, and R_3 respectively and exchange the data stored in R_0 with R_1 and R_2 with R_3. [(CO4)(Solve/IOCQ)]

6 + (1 + 1 + 1) + 3 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	53.12	29.17	17.71

Course Outcome (CO):

After the completion of the course students will be able to
1. Understand the architecture of 8-bit microprocessor (8085A).
2. Develop the skill in program writing of 8-bit microprocessor (8085A).
3. Understand the architecture and develop the skill in program writing of 16-bit microprocessor (8086).
4. Understand the architecture and develop the skill in program writing of microprocessor 8051 and PIC16F877.
5. Understand the architecture and operation of programmable peripheral device 8255A.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question