

**MICROPROCESSORS & MICROCONTROLLERS
(AEIE 3103)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one 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) Select the invalid register pair combination from the following
(a) B and C (b) C and D (c) D and E (d) H and L.
- (ii) In JPE 8000_H instruction program execution will be shifted to 8000_H memory location when
(a) P = 0 (b) P = 1 (c) S = 0 (d) S = 1.
- (iii) What is the content of A and B registers after the execution of ANA B instruction? Let the initial values are A=0F_H, B=F0_H.
(a) A=0F_H, B=F0_H (b) A=00_H, B=00_H (c) A=00_H, B=F0_H (d) A=0F_H, B=00_H.
- (iv) Which mode of 8255 is also known as I/O mode with handshake signal?
(a) BSR (b) Mode 0 (c) Mode 1 (d) Mode 2.
- (v) Number of memory chip required to design a 64kB memory using 8kB memory chip is
(a) 1 (b) 4 (c) 8 (d) 16.
- (vi) If the operating frequency of 8085 is 2 MHz, then the time required to execute MVI A, 22_H instruction is
(a) 2 μsec (b) 3.5 μsec (c) 14 μsec (d) 22 μsec.
- (vii) What is the address of Port B, if the Port A address of 8255 PPI is D0_H?
(a) D0_H (b) D1_H (c) D2_H (d) D3_H.
- (viii) What is the content of the SP register in the 8051 microcontroller after a reset operation?
(a) 00H (b) 07H (c) 0000H (d) FFH.
- (ix) In 8051 microcontroller the internal RAM memory size is
(a) 128 byte (b) 256 byte (c) 2 kbyte (d) 4 kbyte.
- (x) 8051 μC will read instruction from its internal program memory if
(a) RST pin is at logic 0 (b) RST pin is at logic 1
(c) \overline{EA} pin is at logic 0 (d) \overline{EA} pin is at logic 1.

Group- B

2. (a) With one suitable example discuss the function of PC and SP register in 8085 microprocessor. [(CO1)(Remember/LOCQ)]
- (b) Discuss the function of following signal in 8085 microprocessor (any two) –
 (i) IO/\bar{M} (ii) ALE (iii) \overline{INTA} [(CO1)(Understand/LOCQ)]
- (c) Read the program and answer the following questions:
- ```

LXI B, 000AH
Loop: DCX B
 MOV A, B
 ORA C
 JNZ Loop
 HLT

```
- (i) What is the function of DCX B instruction?  
 (ii) What is the function of ORA C instruction?  
 (iii) How many times the loop will be executed? [(CO2)(Analyze/IOCQ)]
- (2 + 2) + (2 × 2) + (1 + 1 + 2) = 12**
3. (a) Discuss the process of function call in 8085 microprocessor using one suitable example. [(CO2)(Remember/LOCQ)]
- (b) Calculate the amount of delay generated in the following subroutine.
- ```

MVI B, 00H
MVI C, FFH
Loop: INR B
      DCR C
      JNZ Loop
      RET.
  
```
- [(CO5)(Analyse/IOCQ)]
- (c) Write an ALP for 8085 microprocessor to store the last two digits of your autonomy roll and registration numbers in memory location 4000_H and 4001_H. Multiply the content of memory location 4000_H and 4001_H. Store the result in memory location starting from 4002_H. [(CO2)(Solve/IOCQ)]
- 3 + 4 + 5 = 12**

Group - C

4. (a) What are the drawbacks of the Memory-mapped I/O technique? [(CO3)(Remember/LOCQ)]
- (b) Design a circuit to interface one 4kB ROM and one 4kB RAM memory chips to 8085 microprocessor. The first address in the ROM memory chip is 0000_H and the last address in RAM memory chip is ZFFF_H. Where, Z is the last digit of your registration number. [(CO3)(Design/HOCQ)]
- 2 + 10 = 12**
5. (a) What is difference between vectored and non-vectored interrupts of 8085 microprocessor. Give an example of maskable and non-maskable interrupts of 8085 microprocessor. [(CO4) (Understand/LOCQ)]

- (b) Design a circuit to interface 8 LEDs to 8085 microprocessor with I/O port address XX_H. Where, XX is the last two digits of your autonomy roll number. [[C03](Design/HOCQ)]
- (c) Write a program for the above circuit to continuously blink (ON and OFF) the LEDs. [[C03](Solve/IOCQ)]
(2 + 2) + 4 + 4 = 12

Group - D

6. (a) Draw and discuss the control word register (CWR) format of 8255 PPI in I/O mode. [[C06](Remember/LOCQ)]
- (b) Design a circuit to interface 8 LEDs to 8085 microprocessor using 8255 PPI. Connect the LEDs to Port C of 8255. Let the Port A address of 8255 PPI is X0_H Where, X is the last digit of your autonomy roll number. [[C06](Design/HOCQ)]
- (c) Write a program for the above circuit to display the following pattern on LEDs using BSR MODE of 8255.

LED8	LED7	LED6	LED5	LED4	LED3	LED2	LED1
ON	ON	ON	ON	OFF	OFF	OFF	OFF

[[C06] (Solve/IOCQ)]
(1 + 2) + 4 + 5 = 12

7. (a) Write short notes on (any one)
- (i) Stepper motor control using 8255 PPI.
- (ii) Internal architecture of 8254. [[C06] (Remember/LOCQ)]
- (b) Design a circuit to interface one ADC to 8085 microprocessor using 8255 PPI. Let the Port A address of 8255 PPI is X0_H. Where, X is the last digit of your autonomy roll number. [[C06] (Design/HOCQ)]
6 + 6 = 12

Group - E

8. (a) What are the differences between microprocessor and microcontroller? [[C01] (Remember/LOCQ)]
- (b) Write the main features of 8051 microcontroller? [[C01] (Understand/LOCQ)]
- (c) Write a program for 8051 microcontroller to copy a block of data from one memory (internal RAM) location to another memory location in reverse order. [[C02](Solve/IOCQ)]
3 + 3 + 6 = 12
9. (a) With suitable block diagram explain the RAM memory organization in 8051 microcontroller. [[C01] (Remember/LOCQ)]
- (b) Design a circuit to interface one LED and one switch to 8051 microcontroller. [[C06] (Design/HOCQ)]
- (c) Write a program for the above circuit to turn ON the LED if the switch is close and turn OFF the LED if the switch is open. [[C06] (Solve/IOCQ)]
6 + 3 + 3 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	39.58	32.29	28.12

Course Outcome (CO):

After the completion of the course students will be able to:

1. Learn the architecture of 8 bit microprocessor (8085), 8051 and PIC (PIC16F877) microcontrollers
2. Develop the skill in program writing for 8085 microprocessor, 8051 and PIC microcontroller
3. Realize the interfacing of memory, input/output devices with 8085 microprocessor
4. Understand the interrupts of 8085 microprocessor, 8051 and PIC microcontroller
5. Learn the use of timer/counter and serial data communication process in 8085 microprocessor and 8051 microcontroller
6. Apply the knowledge to interface different type of I/O devices with 8085 microprocessor, 8051 and PIC microcontroller

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