MICROPROCESSORS & MICROCONTROLLERS
(AEIE 3103)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

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

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) Data bus of 8085 Microprocessor is
(a) 8 bit unidirectional (b) 16 bit unidirectional
(c) 8 bit bidirectional (d) 16 bit bidirectional.

(ii) The number of general purpose register in 8085 Microprocessor is
(a) 1 (b) 2 (c) 6 (d) 8.

(iii) Address bus of 8085 Microprocessor is
(a) 8 bit unidirectional (b) 16 bit unidirectional
(c) 8 bit bidirectional (d) 16 bit bidirectional.

(iv) In CPI 25_H instruction if the content of 'A' register is 25_H, then the values of 'CY' and 'Z' flag bits are
(a) CY=0 and Z=0 (b) CY=0 and Z=1
(c) CY=1 and Z=0 (d) CY=1 and Z=1.

(v) In JNZ 9100_H instruction the program sequence will be shifted to 9100_H memory location when
(a) CY flag =0 (b) CY flag =1
(c) Z flag =0 (d) Z flag =1.

(vi) If the operating frequency of 8085 Microprocessor is 2 MHz, then the time required to execute MOV A, B instruction is?
(a) 2 μsec (b) 4 μsec
(c) 5 μsec (d) 7 μsec.

(vii) In I/O Write operation what are the status of $IO/\overline{M}$, $\overline{RD}$ and $\overline{WR}$ control signals?
(a) $IO/\overline{M} = 0, \overline{RD} = 0$ and $\overline{WR} = 0$ (b) $IO/\overline{M} = 0, \overline{RD} = 0$ and $\overline{WR} = 1$
(c) $IO/\overline{M} = 1, \overline{RD} = 1$ and $\overline{WR} = 0$ (d) $IO/\overline{M} = 1, \overline{RD} = 0$ and $\overline{WR} = 1$.

(viii) What is the address of Port B of 8255 PPI, if the Port A address is $A0_H$?
(a) $A0_H$ (b) $A1_H$ (c) $A2_H$ (d) $A3_H$.

(ix) What is the address of Port C of 8255 PPI, if the Port A address is 90_H?
(a) 90_H (b) 91_H (c) 92_H (d) 93_H.

(x) What is the size of the internal ROM memory in an 8051 Microcontroller?
(a) 128 byte (b) 256 byte
(c) 2 kbyte (d) 4 kbyte.

Fill in the blanks with the correct word

(xi) DAD B is a _____ byte instruction.

(xii) LXI B, 2050_H is a _____ byte instruction.

(xiii) Number of memory chip required to design a 16 kb memory using 4 kb memory chip is _____.

(xiv) After RESET operation the content of SP register in 8051 Microcontroller is _____.

(xv) The 8051 Microcontroller has _____ number of IO port.

Group - B

2. (a) Classify the different instructions of 8085 Microprocessor using one relevant example based on instruction size. *[(CO1)(Remember/LOCQ)]*

(b) Write the 8085 Microprocessor instruction to perform the following operations:
(i) Transfer one byte of data from 'A' register to memory location using 'DE' register pair as pointer.
(ii) Increment the content of 'BC' register pair by 1.
(iii) AND the content of A register with memory location pointed by HL.
(iv) Jump to 8050_H memory location if Carry flag bit is 1. *[(CO2)(Remember/LOCQ)]*

(c) Write an ALP for 8085 Microprocessor to transfer a block of data starting from memory location 8100_H to another memory location starting from 8200_H in reverse order. The block contains 20 byte data. *[(CO2)(Apply/IOCQ)]*

3 + 4 + 5 = 12

3. (a) Briefly discuss the different programmable registers of 8085 Microprocessor. *[(CO1)(Remember/LOCQ)]*

(b) What is the function of $IO/\overline{M}$ and ALE signals of 8085 Microprocessor? *[(CO1)(Remember/LOCQ)]*

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

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    XRA
    MVI A, 82H
    MVI C, 8FH
    ADD C
    JNC L1
    ANI 0FH
L1: HLT
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(i) What is the final value of the 'A' register and carry flag at the end of the program?

(ii) What is the final content of 'A' register if the "JNC L1" instruction is replaced by the "JC L1" instruction?

(iii) Write an 8085 Microprocessor instruction to store the final value of 'A' register to memory location $9000_{H.}$ *[(CO2)(Analyze/IOCQ)]*

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

Group - C

4. (a) Design an interfacing circuit to connect one 4KB ROM to 8085 Microprocessor. The starting address of ROM is $Y000_H$ (where, Y is the last digit of your autonomy roll number). *[(CO3)(Create/HOCQ)]*

(b) Write an ALP for 8085 Microprocessor to transfer (copy paste) a block of data stored at memory location starting from $Y100_H$ to another memory location starting from $Y200_H$. Let, the source block contains 10 byte data. *[(CO2)(Apply/IOCQ)]*

7 + 5 = 12

5. (a) Design an interfacing circuit to connect 8 LEDs and 8 switches to 8085 Microprocessor. The LEDs I/O port address is XY_H, while the switches I/O port address is $XY+1_H$. (where, XY is the last two digits of your autonomy roll number). *[(CO3)(Create/HOCQ)]*

(b) Write an ALP for 8085 Microprocessor to blink (ON and OFF) the LEDs continuously. *[(CO2)(Apply/IOCQ)]*

8 + 4 = 12

Group - D

6. (a) Draw and discuss the control word register (CWR) format of 8255 PPI in BSR mode. *[(CO6)(Remember/LOCQ)]*

(b) Design an interfacing circuit to connect one 7-segment display to 8085 Microprocessor using 8255 PPI. The Port A address of 8255 PPI is $Y0_H$ (where, Y is the last digit of your autonomy roll number). *[(CO6)(Create/HOCQ)]*

(c) Write a program for the above circuit to display the letter 'A' on the 7-segment display. *[(CO6)(Apply/IOCQ)]*

(1 + 2) + 4 + 5 = 12

7. (a) Explain the function of the various bits of Port C of an 8255 PPI when both Port A and Port B are set as input ports in mode 1. *[(CO6)(Remember/LOCQ)]*

(b) Write short notes on (any one)

(i) 8254 programmable timer and counter

(ii) 8251 USART. *[(CO6)(Remember/LOCQ)]*

6 + 6 = 12

Group - E

8. (a) What are the differences between Microprocessor and Microcontroller? *[(CO1)(Remember/LOCQ)]*

(b) With suitable block diagram explain the RAM memory organization in 8051 Microcontroller. *[(CO1)(Remember/LOCQ)]*

(c) Write a program for 8051 Microcontroller to add 6 byte data stored at RAM location starting from 40_H. Store the result (including carry) in RAM location starting from 50_H. *[(CO2)(Solve/IOCQ)]*

3 + 5 + 4 = 12

9. (a) Design a circuit to connect one 7-segment display to 8051 Microcontroller. *[(CO6)(Design/HOCQ)]*

(b) Write a program for the above circuit to display the last digit of your autonomy roll number on 7-segment display. *[(CO6)(Solve/IOCQ)]*

(c) Write short notes on (*any one*).
(i) TMOD register of 8051 Microcontroller.
(ii) Serial data communication in 8051 Microcontroller. *[(CO5)(Remember/LOCQ)]*

3 + 4 + 5 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	44.79	32.29	22.92

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.*