MICROPROCESSOR & 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) In CMP B instruction if the content of 'A' and 'B' registers are equal, 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.

(ii) What is the content of A and B registers after the execution of ANA L instruction? Let the initial values are $A=0F_H$, $L=F0_H$
(a) $A=0F_H$, $B=F0_H$ (b) $A=00_H$, $B=00_H$
(c) $A=00_H$, $B=F0_H$ (d) $A=0F_H$, $B=00_H$

(iii) Which of the following pin is used to de-multiplex the lower order address bus and data bus?
(a) $IO/\overline{M}$ (b) $\overline{RD}$ (c) $READY$ (d) ALE

(iv) If the operating frequency of 8085 Microprocessor is 2 MHz, then the time required to execute MOV B, A instruction is
(a) 2 µsec (b) 3 µsec (c) 4 µsec (d) 8 µsec.

(v) What is the last address in a 8KB RAM if the starting address is 0000_H?
(a) $0FFF_H$ (b) $01FF_H$ (c) $03FF_H$ (d) $FFFF_H$.

(vi) What is the number of memory chips required to create a 64 KB memory using a 16KB memory chip?
(a) 1 (b) 4 (c) 8 (d) 64.

(vii) 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) $A3_H$.

(viii) What does 8254 signify in the context of microprocessors?
(a) Programmable peripheral interface
(b) Programmable interval timer/counter
(c) Programmable interrupt controller
(d) Universal Synchronous/Asynchronous Receiver/Transmitter (USART).

(ix) What is the size of the internal RAM memory in an 8051 microcontroller?
(a) 128 byte (b) 256 byte (c) 2 Kbyte (d) 4 Kbyte.

(x) In 8051 microcontroller, if RS1=0 and RS0=1 then the selected register bank is
(a) Bank 0 (b) Bank 1 (c) Bank 2 (d) Bank 3.

Fill in the blanks with the correct word

(xi) The number of general purpose register in 8085 Microprocessor is _____.

(xii) ADI 58_H instruction consists of _____ number of machine cycles.

(xiii) In 8255 PPI BSR mode is called _____.

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

(xv) The 8051 microcontroller has _____ number of register bank.

Group - B

2. (a) With one suitable example discuss the function of SP register in 8085 microprocessor. What is the function of READY and SID pins in 8085 microprocessor? *[(CO1)(Remember/LOCQ)]*

(b) Write the 8085 microprocessor instruction (only one instruction, not code) to perform the following operations.
(i) Exchange the content of 'DE' register pair with 'HL' register pair.
(ii) Subtract 83_H data from 'A' register.
(iii) Store 'HL' register pair data to memory location 8000_H and 8001_H.
[(CO2)(Apply/IOCQ)]

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

Mnemonics
MVI A, 67H
LXI D, 0F00H
ANA D
INR A
SUI 28H
JNC Skip1
MVI A, FFH
JMP Skip2
Skip1: MVI A, 00H
Skip2: HLT

(i) What is the final content of the 'A' register at the end of the program?
(ii) What is the final content of 'A' register if the 'JNC Skip1' instruction is replaced by the 'JC Skip1' instruction? *[(CO2)(Analyse/HOCQ)]*

(2 + 3) + 3 + (3 + 1) = 12

3. (a) Write the name of programmable and non-programmable registers in 8085 microprocessor. With one suitable circuit diagram explain the process of de-multiplexing of lower order address bus and data bus in 8085 microprocessor.
[(CO1)(Remember/LOCQ)]

(b) Write the 8085 microprocessor instruction (only one instruction, not code) to perform the following operations.
(i) Load '9060_H' data in 'SP' register.
(ii) Increment the content of 'A' register by 1.
(iii) Perform XOR operation between 'A' register and '$F0_H$' data. *[(CO2)(Apply/IOCQ)]*

(c) Write an ALP for 8085 Microprocessor to transfer a block of data starting from memory location 8200_H to another memory location starting from 8250_H in reverse order. The block contains 10 byte data. *[(CO2)(Apply/IOCQ)]*

(2 + 3) + 3 + 4 = 12

Group - C

4. (a) Write the name of the machine cycles in the following instructions.
(i) MOV H, A
(ii) STA $9100_{H.}$ *[(CO1)(Understand/LOCQ)]*

(b) Calculate the time required to execute the above instructions. Let the operating frequency of 8085 microprocessor is 3 MHz. *[(CO1)(Apply/IOCQ)]*

(c) Design an interfacing circuit to connect 8 LEDs and one 7 segment display unit to 8085 Microprocessor. The LEDs I/O port address is XY_H, while the I/O port address of 7 segment is $(XY+1)_H$ (where, XY is the last two digits of your autonomy roll number). *[(CO3)(Design/HOCQ)]*

3 + 2 + 7 = 12

5. (a) Write the name of the machine cycles in the following instructions.
(i) LXI SP, $FF00_H$
(ii) ORI $00_{H.}$ *[(CO1)(Understand/LOCQ)]*

(b) Calculate the time required to execute the above instructions. Let the operating frequency of 8085 microprocessor is 3 MHz. *[(CO1)(Apply/IOCQ)]*

(c) Design a circuit to interface one 32KB ROM and one 32KB 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 $FFFF_H$. *[(CO3)(Design/HOCQ)]*

3 + 2 + 7 = 12

Group - D

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

(b) Design an interfacing circuit to connect 8 DIP switches 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 read the status of the switches and store it in memory location 9300_H. *[(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 output ports in mode 1. *[(CO6)(Remember/LOCQ)]*

(b) Write short notes on (any one):
(i) Mode 2 operation of 8255 PPI
(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)(Apply/IOCQ)]*

3 + 5 + 4 = 12

9. (a) Design a circuit to interface one LED and one switch to 8051 microcontroller. *[(CO1)(Remember/LOCQ)]*

(b) Write a program for the above circuit to turn on the LED when the switch is closed and turn it off when the switch is opened. *[(CO2)(Apply/IOCQ)]*

(c) Briefly discuss the interrupts in 8051 microcontroller. *[(CO4)(Remember/LOCQ)]*

3 + 3 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	50	27	23