

**MICROPROCESSOR & MICROCONTROLLER
(ELEC 3202)**

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) The first machine cycle of an instruction is always
 - (a) Memory read cycle
 - (b) An opcode fetch cycle
 - (c) I/O read cycle
 - (d) Memory write cycle
- (ii) In Intel 8085 microprocessor PSW signifies
 - (a) Accumulator content only
 - (b) Accumulator and flag register contents
 - (c) Flag register content only
 - (d) Content of stack pointer only
- (iii) Which interrupt will be enabled after execution of the following instructions in Intel 8085 microprocessor?
MVI A, 0EH
SIM
 - (a) RST 6.5
 - (b) RST 5.5
 - (c) RST 7.5
 - (d) INT R
- (iv) Which interrupt has the highest priority in 8085 microprocessor?
 - (a) RST 5.5
 - (b) TRAP
 - (c) RST 6.5
 - (d) INTR
- (v) Suppose, for an 8255A PPI chip, signals on $\overline{CS} = 0$, $A1 = 0$, $A0 = 1$; which of the following is to be selected?
 - (a) port A
 - (b) port B
 - (c) port C
 - (d) control register
- (vi) In 8051 microcontroller range of bit addressable area in internal RAM is
 - (a) 20H-2FH
 - (b) 00H-7FH
 - (c) 80H-FFH
 - (d) 00H-FFH
- (vii) Which of the following instructions will give an error in an 8051 microcontroller?
 - (a) MOV A, DPTR
 - (b) MOV A, R0
 - (c) MOV R1, DPL
 - (d) MOV R2, A

Fill in the blanks with the correct word

- (xi) The number of T states required to execute MOV A, B is _____.
- (xii) The instruction of 8085 microprocessor which rotates the bits of the accumulator contents left by one position through carry flag is _____.
- (xiii) After executing the instruction XRA A, the contents of accumulator will be _____.
- (xiv) Asynchronous transmission in 8051 always begins with _____ bit.
- (xv) The instruction to store F4 H data into accumulator of 8051 microcontroller using immediate addressing mode is _____.

Group - B

2. (a) Sketch and explain the timing diagram of the instruction MVI A, 45^H.
[(CO1)(Understand/LOCQ)]

(b) Explain the function of the following signals related to 8085 microprocessor:
(i) HOLD and HLDA, (ii) IO/̄M. [(CO1)(Apply/IOCQ)]

(c) Evaluate the time required by the 8085 microprocessor to execute the instruction STA FFF9^H. Consider a crystal frequency of 6 MHz. [(CO1)(Evaluate/HOCQ)]

$$4 + 5 + 3 = 12$$

3. (a) Define the following instructions related to Intel 8085 microprocessor:

- (i) LDA E001H
- (ii) PUSH D [(CO1)(Remember/LOCQ)]

(b) Identify the status of (i) Sign, (ii) Zero, (iii) Auxiliary Carry, (iv) Carry, (v) Parity flags and (vi) Accumulator contents after execution of the following program for Intel 8085 microprocessor.

MVI A, A5H
ADI 9FH
HLT [(CO1)(Apply/IOCQ)]

(c) Write an Assembly Language Program to obtain the largest number from a set of ten 8-bit numbers which are stored in ten consecutive memory locations starting from F200H. The largest number is to be stored in F300H. *[(CO1) (Create/HOCQ)]*

$$4 + 4 + 4 = 12$$

Group - C

4. (a) State the difference between I/O mapped I/O and memory mapped I/O. *[(CO2) (Remember/LOCQ)]*

(b) Develop an interfacing circuit for an 8KB EPROM with the 8085 using a NAND gate decoder such that the starting address assigned to the chip is A000H. *[(CO2) (Analyse/LOCQ)]*

(c) Develop an assembly language program to set the interrupt mask so that RST 5.5 is enabled, RST 6.5 is masked, and RST 7.5 is enabled. Determine the content of the accumulator first. *[(CO2) (Evaluate/HOCQ)]*

$$4 + 5 + 3 = 12$$

5. (a) What will be the control words for 8255A in BSR mode to set bit PC1 and bit PC2 and reset bit PC4? *[(CO2) (Remembering/LOCQ)]*

(b) Explain the control word for 8255A mode zero operation to read the input from port A and send the output at port B. *[(CO2) (Evaluate/HOCQ)]*

(c) Develop an assembly language program for Intel 8085 microprocessor to generate a triangular wave using 8255A. Assume the address of the control register is 83H and the output device is connected with port B of 8255A and also assume the address of port B is 81H. *[(CO2) (Apply/LOCQ)]*

$$3 + 4 + 5 = 12$$

Group - D

6. (a) Describe the fundamental architectural characteristics of 8051 microcontrollers. *[(CO3) (Remember/LOCQ)]*

(b) Explain the structure of registers within the 128-byte internal RAM and how various register banks are chosen. *[(CO3) (Analyse/LOCQ)]*

(c) Explain the function of \overline{PSEN} signal in 8051 microcontroller. *[(CO3) (Evaluate/HOCQ)]*

$$4 + 5 + 3 = 12$$

7. (a) Explain the following 8051 microcontroller instructions:

- (i) ADD A, 25H
- (ii) DIV AB
- (iii) MOV A, # 2BH

(b) Construct an 8051 based assembly language program to generate a square wave of 75% duty cycle of frequency 1 kHz through the pin P1.0 while considering the crystal frequency as 11.0592 MHz *[(CO3) (Understand /LOCQ)]* *[(CO3) (Apply/LOCQ)]*

(c) Conclude the status of CY, OV and AC flags of the 8051 microcontroller, after execution of the following set of instructions.

MOV R0, # 25H
 MOV 25H, # 0A5H
 MOV A, # 33H
 ADD A, @ R0

[(CO3)(Create/HOCQ)]

4 + 5 + 3 = 12

Group - E

8. (a) Describe the function of the SBUF register in both transmission and reception of data. *[(CO4)(Understand/LOCQ)]*

(b) Derive the BAUD rate equation for serial communication in context of mode 1 operation of UART and explain the role of SMOD bit. *[(CO4)(Apply/IOCQ)]*

(c) Develop an assembly language program for the 8051 to transfer letter "A" serially using "9600, 8, N, 1" protocol. Consider a crystal frequency of 11.0592 MHz *[(CO4)(Create/HOCQ)]*

4 + 5 + 3 = 12

9. (a) Design the interfacing connection of 8051 microcontroller to a unipolar stepper motor. *[(CO4)(Create/HOCQ)]*

(b) Explain the above circuit properly. *[(CO4) (Understand/LOCQ)]*

(c) Develop the Assembly Language Program to rotate that motor 90° in clockwise direction in 4 step sequence. Given: motor step angle = 2°. *[(CO4) (Apply/IOCQ)]*

3 + 3 + 6 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	31.25	41.67	27.08