MCA-101

COMPUTER ORGANIZATION AND ARCHITECTURE

Time Allotted: 3 Hours | Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP A
(Multiple Choice Type Questions)

1. Answer all questions. $10 \times 1 = 10$

(i) A full subtractor can be designed with a full adder by

(A) only changing the circuit
(B) adding a NOT with the SUM input
(C) adding a NOT with CARRY input
(D) none of these

(ii) How many bits are needed to represent a digit in hexadecimal notation?

(A) 8 (B) 16
(C) 4 (D) 2

(iii) Conversion of $(FAFAFA)_{16}$ into octal form is

(A) 76575372 (B) 76575370
(C) 7675374 (D) 72727272

(iv) 1 nibble is equal to

(A) 2 bits (B) 8 bits
(C) 4 bits (D) 16 bits

(v) Which of the following addressing mode is used in 'PUSH B'?

(A) direct (B) immediate
(C) register (D) register-immediate

(vi) Which of the following input combinations is not allowed in SR Flip-Flop?

(A) S = 0, R = 0 (B) S = 1, R = 1
(C) S = 0, R = 1 (D) S = 1, R = 0

(vii) Gray code for binary 1011

(A) 1101 (B) 1110
(C) 1001 (D) 0111

(viii) How many address bits are required for a 1024 × 8 memory unit?

(A) 2 (B) 8
(C) 10 (D) 12

(ix) The basic principle of a Von-Neumann Computer is

(A) storing both data and program in same memory
(B) storing both data and program in separate memory
(C) storing only data
(D) storing only program

(x) Which of the following operation is not directly possible in 8085 microprocessor?

(A) MUL (B) DIV
(C) CMA (D) both (A) and (B)

GROUP B
(Short Answer Type Questions)

Answer any *three* questions. 3×5 = 15

2. With truth table and Boolean function, design a half adder circuit with minimum number of 2-input NOR gates only. 5

3. Differentiate between hardware control and microprogrammed control unit. 5

4. Convert a JK Flip-flop into a D Flip-Flop. You can use additional circuitry, if required. 5

5. (a) Add the following numbers using 2's complement method. +30 and –22 4+1
   (b) What is the 2's complement of $(1000\ 1111\ 0001\ 1110)_2$?

6. Explain Associative memory. 5

GROUP C
(Long Answer Type Questions)

Answer any *three* questions. 3×15 = 45

7. (a) Construct a full Subtracter with half adders and an additional gate. 6
   (b) Construct XOR using NAND. 3
   (c) What is truth table? Why it called so? 3
   (d) Design the circuit AB+BC(B + C). 3

8. (a) Write down the De Morgan's Theorem? 3
   (b) Simplify using Boolean algebra 6
   (i) (A + (BC)′) ′
   (ii) A′BC + AB′C + ABC′ + ABC

(c) Simplify using K map 6
(i) (A + AB)
(ii) A′B′C + A′BC + AB′C + ABC

9.(a) What is bus speed? 2
(b) What is PLA? 2
(c) Describe basic architecture of a digital computer. 6
(d) Design the circuit using multiplexer $F(A,B,C)=\sum(0,1,3,4,8,9,15)$. 5

10.(a) What is micro controller? 3
(b) Write a 8085 instruction code for swap two value. 6
(c) Write a 8085 instruction code for add three number with 200. 6

11. Write short notes on any *three* of the following: 3×5
(a) D flip flop
(b) RAM and ROM
(c) ALU
(d) binary comparator
(e) decoder and encoder
(f) circuit design with multiplexer