MAY-24-1044

MCA-6103 (Computer Organization and Architecture)

MCA-1st CBCS/NEP

Time : 3 Hours   Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note: Attempt five questions in all, selecting one question each from Section A, B, C and D. Section E is compulsory.

SECTION A

1. Perform the arithmetic operations (+70) + (+80) and (-70) + (-80) with binary numbers in signed-2's complement representation. Use eight bits to accommodate each number together with its sign. Show that overflow occurs in both cases, that the last two carries are unequal, and that there is a sign reversal.   (12)

OR

2. a) Obtain the 9's complement of the following eight-digit decimal numbers: 12349876; 00980100; and 90009951.
                                                                          (6)

   b) Obtain the 10's complement of the following six-digit decimal numbers: 123900; 090657; and 100000.   (6)

SECTION B

3. Design a sequential circuit with two JK flip-flops A and B and two inputs E and x. If E = 0, the circuit remains in the same state regardless of the value of x. When E = 1 and x = 1, the

circuit goes through the state transitions from 00 to 01 to 10 to 11 back to 00, and repeat. When $E = 1$ and $x = 0$, the circuit goes through the state transitions from 00 to 11 to 10 to 01 back to 00, and repeat.   (12)

OR

4. Starting from an initial value of $R = 11011101$, determine the sequence of binary values in R after a logical shift-left, followed by a circular shift-right, followed by a logical shift-right and a circular shift-left.   (12)

SECTION C

5. What is the difference between a direct and an indirect address instruction? How many references to memory are needed for each type of instruction to bring an operand into a processor register?   (12)

OR

6. A two-word instruction is stored in memory at an address designated by the symbol W. The address field of the instruction (stored at W + 1) is designated by the symbol Y. The operand used during the execution of the instruction is stored at an address symbolized by Z. An index register contains the value X. State how Z is calculated from the other addresses if the addressing mode of the instruction is   (12)

   a. direct

   b. indirect

   c. relative

   d. indexed

SECTION D

7. a. Consider a computer without priority interrupt hardware. Any one of many sources can interrupt the computer, and any interrupt request results in storing the return address and branching to a common interrupt routine. Explain how a priority can be established in the interrupt service program.

(6)

b. What is DMA Controller? Draw the working diagram of DMA Controller.

(6)

8. An 8-bit computer has a 16-bit address bus. The first 15 lines of the address are used to select a bank of 32K bytes of memory. The high-order bit of the address is used to select a register which receives the contents of the data bus. Explain how this configuration can be used to extend the memory capacity of the system to eight banks of 32K bytes each, for a total of 256K bytes of memory.

(12)

SECTION E (Compulsory)

9. a. Find the binary equivalent of the octal Numbers 13.54 .

b. What is Normalization in floating point representation of numbers?

c. What are flip-flops and how do they work?

d. What do you mean by memory transfer?

e. How is address sequencing done in microprogrammed control unit?

f. What are the interfaces in I/O organization?   (6×2=12)