

(2½ Hours)

Total Marks 75

- NOTE:**
- 1) All questions are compulsory.
  - 2) Figures to the right indicate full marks.
  - 3) Illustrations, in-depth answers and diagrams will be appreciated.
  - 4) Mixing of sub-questions is not allowed.

**1. 1) Attempt All Questions.****15****a) Multiple Choice Questions.**

- i) The decoded instruction is stored in \_\_\_\_\_.
  - a) IR    b) PC    c) Registers    d) MDR
- ii) \_\_\_\_\_ is used to store data in registers.
  - a) D Flip-flop    b) JK Flip-flop
  - c) RS Flip-flop    d) None of these
- iii) ANSI stands for \_\_\_\_\_.
  - a) American National Standards Institute
  - b) American National Standard Interface
  - c) American Network Standard Interfacing
  - d) American Network Security Interrupt
- iv) The instruction, Add #45, R1 does \_\_\_\_\_.
  - a) Adds the value of 45 to the address of R1 and stores 45 in that address.
  - b) Adds 45 to the value of R1 and stores it in R1.
  - c) Finds the memory location 45 and adds that content that of R1.
  - d) None of these.
- v) The addressing mode which uses the PC instead of a general purpose register is \_\_\_\_\_.
  - a) Indexed with offset    b) Relative
  - c) direct    d) Both a) and c)

**b) Fill in the blanks (Attempt all)**

- i) Flip-flop is a basic element of \_\_\_\_\_ circuits.
- ii) The Minimum number of selection inputs required for selecting on out of 32 inputs are \_\_\_\_\_.
- iii) Race condition may exist in \_\_\_\_\_ sequential circuits.
- iv) When 1101 is used to divide 100010010 the remainder is \_\_\_\_\_.
- v) The usual BUS structure used to connect the I/o devices is \_\_\_\_\_.

**TURN OVER**

- c) Short Answers (Attempt all)
- What are shift registers?
  - Design NOR gate using AND, OR, NOT gates.
  - Define SOP and POS terms.
  - How instructions of typical microprocessors are classified?
  - What are uses of interrupts?

**2. Attempt the following (Any Three):**

15

- With the help of neat diagram explain basic functional units of a computer.
- How the memory and the processor can be connected? Explain with diagram.
- Perform with 2's complement arithmetic:  $-34+22$
- List and explain in brief main features of fourth generation computers.
- List the steps needed to execute the machine instruction. Load R2, LOC
- Design half-adder circuit.

**3. Attempt the following (Any Three):**

15

- Explain Big - Endian and Little - Endian Assignments.
- What are addressing modes? Why different addressing modes are required? Explain different RISC - type addressing modes.
- Compare RISC and CISC instruction sets.
- A typical computer must support instructions capable of performing four types of operations. List and explain these operations with at least one instruction.
- What is an assembler? What is object program?
- Consider instruction:

$$C \leftarrow [A] + [B]$$

With neat figure show a possible program segment for this task as it appears in the memory of a computer.

**4. Attempt the following (Any Three):**

15

- List and explain with neat diagram main hardware components of processor.
- Consider the RISC Style Load instruction

$$\text{Load RS, x(R7)}$$

Examine the actions involved in fetching and executing the above instruction.

- Explain with neat diagram conceptual view of the hardware needed for computation.

**TURN OVER**



- d) Explain 5-stage organization with neat figure. What is Datapath?
- e) Explain with example sequence of actions needed to fetch and execute an unconditional branch instruction.
- f) How the processor generates the control signals that cause these actions to take place in the correct sequence and at the right time?

5. Attempt the following (Any Three) :

15

- a) Convert the following pairs of decimal numbers to 5-bit 2's-complement numbers, and then perform addition and subtraction an each pair. Indicate whether or not overflow occurs for each case.
  - (a) 7 and 13
  - (b) -12 and 9
- b) Write a RISC - Style Program for computing the dot product of two vecotrs.
- c) Derive the logic expressions for a circuit that compares two unsigned numbers:  $X=X_2X_1X_0$  and  $Y=Y_2Y_1Y_0$  and generates three outputs = XGY, XEY, and XLY. One of these outputs is set to 1 to indicate that X is greater than, equal to, or less than Y, respectively.
- d) Design full adder circuit.
- e) What is multiplexer? What is their need? Design 4:1 multiplexer.

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