5467

(2½ Hours) [Total Marks: 75]

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

Q. 1 **Attempt All Questions. (Each of 5 marks)** **(15M)**

(a) **Multiple Choice Questions** **(5M)**

(i) ANSI stands for _____.
a) American National Standards Institute
b) American National Standard Interface
c) American Network Standard Interfacing
d) American Network Security Interrupt

(ii) The decoded instruction is stored in _____.
a) IR b) PC c) Registers d) MDR

(iii) _____ is used to store data in registers.
a) D flip flop b) JK flip flop c) RS flip flop d) none of these

(iv) The addressing mode/s, which uses the PC instead of a general purpose register is _____ .
a) Indexed with offset b) Relative c) direct d) both a and c

(v) 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 to that of R1
d) None of the above

(b) Fill in the **blanks** **(5M)**
(single bus, 1, sequential, JK flip-flop, 5, RS flip-flop, 10, multiple bus)
i) Flip-flop is a basic element of _____ circuits.
ii) The usual BUS structure used to connect the I/O devices is _____.
iii) The minimum number of selection inputs required for selecting on out of 32 inputs are _____.
iv) Race condition may exist in _____ sequential circuits.
v) When 1101 is used to divide 100010010 the remainder is _____.

(c) **Short Answers** **(5M)**
(i) What are uses of interrupts?
(ii) Design NOR gate using AND, OR and NOT gates.
(iii) Define SOP and POS terms.
(iv) How instructions of typical microprocessors are classified?
(v) What are shift registers?

Q. 2 **Attempt the following (Any THREE)(Each of 5Marks)** **(15M)**
(a) With help of neat diagram explain basic functional units of a computer.
(b) How the memory and the processor can be connected? Explain with diagram
(c) Perform with 2's complement arithmetic: - 34 + 17
(d) List and explain in brief main features of fourth generation computers.
(e) Design half-adder circuit.
(f) List the steps needed to execute the machine instruction Load R2, LOC

Q. 3 **Attempt the following (Any THREE) (Each of 5Marks)** **(15M)**

(a) Compare RISC and CISC Instruction Sets.

(b) What are addressing modes? Why different addressing modes are required? Explain different RISC-type addressing modes.

(c) Explain Big-Endian and Little-Endian Assignments.

(d) A typical computer must support instructions capable of performing four types of operations. List and explain these operations with at least one instruction.

(e) Consider instruction C←[A] + [B]
With neat figure show a possible program segment for this task as it appears in the memory of a computer.

(f) What is an assembler? What is object program?

Q. 4 **Attempt the following (Any THREE) (Each of 5Marks)** **(15M)**

(a) List and explain with neat diagram main hardware components of a processor.

(b) Consider the RISC style Load instruction Load R2, X(R7)
Examine the actions involved in fetching and executing the above instruction.

(c) Explain with neat diagram conceptual view of the hardware needed for computation.

(d) Explain 5-stage organization with neat figure. What is the Data path?

(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?

Q. 5 **Attempt the following (Any THREE) (Each of 5Marks)** **(15M)**

(a) Convert the following pairs of decimal numbers to 4-bit 2's-complement numbers, and then perform addition and subtraction on 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 vectors.

(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 a multiplexer? What is their need? Design 4:1 multiplexer.

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