Your Roll No..

Instruction for candidates

1. Write your Roll No. on the top immediately after receiving this question paper.

2. All Questions are compulsory.

1.   **(2x5=10 Marks)**

   a. Convert $(7562)_{10} \rightarrow (\ )_8$ and $(1938)_{10} \rightarrow (\ )_{16}$
   b. What are the differences between circular and logical shift micro-operations?
   c. What is the radix of the numbers if the solution to the quadratic equation $X^2 - 10X + 31 = 0$ is $X = 5$ and $X = 8$
   d. How many flip-flops will be complemented in a 10-bit binary counter to reach the next count after 1001101111?
   e. How many 128 x 8 memory chips are needed to provide a memory capacity of 4096 x 16?

2.   **(3x5=15 Marks)**

   a. Design a counter with the following repeated binary sequence: 0,1,2,3,4,5,6 using J K flip flop.
   b. What are the various micro-operations that will be performed in sequence to fetch an instruction from the memory to an Instruction Register (IR)? Assume suitable set of available registers.
   c. List any 6 BCD digits with an even parity in the leftmost position (total of five bits per digit). Repeat with an odd-parity bit.
   d. The content of a register is initially 1100. The register is shifted five times to the right with serial input 10110. What is the content of the register after each shift?
   e. Construct a 16-to-1 line multiplexer with two 8-to-1 line multiplexers and one 2-to-1 line multiplexer (block diag.).

3.

   a. Write a subroutine to multiply two numbers by a repeated addition method (ex: to multiply 5x4, the program evaluates the product by adding 5 four times, or 5+5+5+5) using BSA instruction.   **(5 Marks)**
   b. An instruction is stored at location 300 with its address field at location 301. The address field at location 301 has the value 400. A processor register R1 contains

the number 200. Evaluate the effective address if the addressing mode of the instruction is **(5 Marks)**

    i. Direct

    ii. Immediate 200

    iii. Relative 201

    iv. Register indirect 400

    v. Index with R1 as the index register 200

c. Define the following: **(5 Marks)**

    i. Flip-flop

    ii. Machine instruction

    iii. Microinstruction

    iv. Instruction format

    v. Interrupt