B. Tech Odd Semester Examination, February, 2023

Computer Science & Engineering

(3rd Semester)

Course No.: CSE-303 (New)

(Digital Electronics)

Full Marks: 50

Pass Marks: 25

Time: 2 hours

Note:
1. Attempt any five questions.
2. Begin each answer in a new page.
3. Answer parts of a question at a place.
4. Assume reasonable data wherever required.
5. The figures in the right margin indicate full marks for the question.
6. All the mathematical symbols and abbreviations have their usual meanings.

1. (a) Why digital circuits are less effected by noise? Why digital circuits are often called switching circuits? 2+4=6

   (b) Express -45 in 8-bit 2's complement form. Write the valid equation for choosing the k parity bit in 7-bit Hamming code. 2+2=4

2. (a) Simplify the following Boolean expression:

   (i) AB + ABC + A´B + AB´

   (ii) AB + B´ C´ + AC´ 2.5+2.5=5

   (b) Reduce the expression (A + B) (A + B´) (A´ + B´) in the POS form using k-map. 5

3. (a) Let A = $a_3\ a_2\ a_1\ a_0$ and B = $b_3\ b_2\ b_1\ b_0$ and xi = $a_i\ b_i + a_i'\ b_i'$ then which relation between A and B does the following expression (F) satisfy?

   $F = a_3'\ b_3 + x_3\ a_2'\ b_2 + x_3\ x_2\ a_1'\ b_1 + x_3\ x_2\ x_1\ a_0'\ b_0$ 5

   (b) Simplify the Boolean function to POS form:

   $F(A, B, C, D) = \Pi_M (1, 3, 5, 7, 12, 13, 14, 15)$ 5

4. (a) Design a combinational circuit that accepts a three bit number and generate an output binary number equal to the square of the input number. 6

   (b) Design a Carry look-ahead adder (CLA). 4

5. (a) Construct decoder implementation of a Full adder. 5

   (b) Realize the function f (A, B, C) = ∑m (1, 5, 6, 7) using 8 × 1 multiplexer. 5

6. (a) Convert the S-R flip-flop to D flip-flop and draw the conversion block diagram. 3+2=5

   (b) Using the following input equation, derived the circuit, state table and state diagram.

   $D_A = A \oplus x \oplus y$

7. (a) Design a mod-8 up asynchronous counter using positive edge triggered JK flip-flop. 5

   (b) Design a 4-bit ring counter using D flip-flop. 5

8. (a) What is the difference between a counter and a shift register? Explain and draw the block diagram for Serial-in, Serial-out (SISO) mode operation of shift register. 2+3=5

   (b) Design a four-bit synchronous binary counter using T flip-flop. 5

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