

GROUP – B**(Short Answer Type Questions)**Answer any *three* of the following. $3 \times 5 = 15$

2. Draw the truth table for a three input adder. Explain clearly the meaning of the input and the output symbols in the truth table. Write the Boolean expressions for the sum and carry. $2 + 2 + 1$
3. Implement XOR operation using four 2-input NAND gates. Verify the output for different combinations of inputs. $3 + 2$
4. a) Prove that the multiplexer is a universal logic module. 3
 b) Use 4-to-1 MUX and other necessary logic gate to design a full-subtractor. 2
5. Simplify the following expressions using Boolean algebra
 i) $AB + A(B + C) + B(B + C)$ 2
 ii) $A'BC + B'CD + AC + A'B'CD'$ 3
6. Use a Karnaugh map to find the minimum sum of products for the expression
 $X = A'B'C + AB'C + A'BC + ABC'$.

GROUP – C**(Long Answer Type Questions)**Answer any *three* of the following. $3 \times 15 = 45$

7. a) Represent the decimal number 45 in
 i) Hexadecimal code
 ii) Gray code
 iii) BCD code. $2 + 2 + 2$
- b) Which gates are called universal gates and why? 2
- c) Design a 2×4 decoder. Give truth table and draw circuit diagram using basic gates. $2 + 2$
- d) Implement the expression using a Multiplexer.
 $F(A, B, C, D) = ? (0, 1, 4, 5, 7, 9, 11, 13, 15)$ 3

8. a) What is combinational circuit ? 2
 b) Differentiate between combinational and sequential circuit. 2
 c) Explain the functionality of clocked JK flip-flop. Give truth table and diagram. 2 + 2 + 2
 d) Explain the Master-Slave Flip-flop. 2
 e) How does it overcome the race condition of J-K flip-flop ? Use proper logic diagram. 1 + 2
9. a) What do you mean by serial shifting ? 2
 b) To shift 4 bit binary data out from SISO shift register what will be the input bits to a shift register ? Explain with proper diagram. What do you mean by modulus of counter ? 2 + 3 + 2
 c) Draw logic diagram for 4 bit Parallel In Parallel Out shift register and explain how it is used to shift data serially. <https://www.makaut.com> 3 + 3
10. Write short notes on any *three* of the following : 3 × 5
 a) Encoder
 b) T Flip-flop
 c) PROM
 d) Priority Checker
 e) Ring counter.
11. a) What is register ? Design a decimal to binary encoder. 2 + 3
 b) What do you mean by shift register ? Explain the Serial-In-Serial-Out shift register. Design a Mod-10 counter. 2 + 3 + 3
 c) What do you mean by Johnson counter ? 2