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Paper Code : BCA-101

DIGITAL ELECTRONICS

Time Allotted : 3 Hours | *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

i) The Boolean equation of AND operation is

a) $Y = \overline{A}$ b) $Y = AB$

c) $Y = A + B$ d) None of these.

ii) The logical expression $Y = A + AB$ is equivalent to

a) $Y = A$ b) $Y = AB$

c) $Y = \overline{AB}$ d) $Y = A + B$.

iii) The BCD equivalent of 57 is

a) 111001 b) 01010111

c) 101111 d) 10001010.

iv) In the BCD code, the decimal number 123 is written as

a) 11011 b) C3

c) 001010011 d) 000100100011.

v) A carry look-ahead adder is frequently used for addition, because it

a) is faster b) is more accurate

c) uses fewer gates d) costs less.

vi) A combinational circuit is one in which the output depends on the

a) input combination at a time

b) previous output and input combination

c) previous input and input combination at a time

d) present output and previous output.

vii) Each individual term in standard SOP form is called as

a) Max-term b) Min-term

c) Mid-term d) None of these.

viii) A decoder with 64 output lines has ..... data inputs.

a) 64 b) 1

c) 6 d) none of these.

ix) The number of flip-flops required to build a Mod-15 counter is

a) 4 b) 5

c) 6 d) 7.

x) The race around condition will be avoided by

a) J-K flip-flop

b) S-R flip-flop

c) Master-Slave flip-flop

d) None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Draw a full adder circuit as combination of 2 half adders.
3. State De Morgan's law and prove it for 2 variables.
4. a) Evaluate $(7352)_{10} - (9456)_{10}$ using 9's complement.

   b) State Duality principle.
5. Minimize the following Boolean expression using *K*-map.

   $F(A, B, C, D) = \sum(0, 1, 3, 6, 8, 10, 11, 13, 15)$.
6. Design a 4-bit parallel-in parallel-out (PIPO) shift register.

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.

   b) Which gates are called universal gates and why ?

   c) Design a 2 × 4 decoder. Giver truth table and draw circuit diagram using basic gates.

d) Implement the expression using a Multiplexer.
$F(A, B, C, D) = \sum(0, 1, 4, 5, 7, 9, 11, 13, 15)$.

3 + 5 + 4 + 3

8. a) What is combinational circuit ?
   b) Differentiate between combinational and sequential circuits.
   c) Explain the functionality of clocked JK flip-flop. Give truth table and diagram.
   d) Convert SR to JK flip-flop. 2 + 3 + 5 + 5

9. a) What is register ?
   b) Design an decimal to binary encoder.
   c) What do you mean by Johnson counter ?

10. What do you mean by race around condition in flip-flop ? Design a J-K flip-flop and discuss its operation. Design and explain the functioning of BCD adder circuit. 5 + 5 + 5

11. Write short notes on any *three* of the following : 3 × 5
   a) Universal Gate
   b) Multiplexer
   c) PAL and PLA
   d) Excitation Table
   e) Full adder using Half-adder.