Level: Bachelor   Semester – Spring   Year   : 2023
Programme: BESE, BECE   Full Marks: 100
Course: Digital Logic   Pass Marks: 45
First Year: First Semester   Time   : 3hrs.

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

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Explain how Digital and Analog electronic systems are different. Also list out the advantages of digital system.   5

   b) Perform the following operation using 9's complement and 2's complement method.   5

      i) $(743)_{10}-(234)_{10}$

      ii) $(234)_{10}-(743)_{10}$

   c) Convert the following numbers from the given base to the other bases indicated.   5

      i) $(11001.111)_2 = (\quad)_8$

      ii) $(5FE.DD)_{16} = (\quad)_8$

      iii) $(203)_8 = (\quad)_4$

      iv) $(777)_8 = (\quad)_{16}$

      v) $(1100)_{\text{GRAY CODE}} = (\quad)_2$

2. a) Simplify the following function F using don't care conditions d, in (1) sum of products and (2) product of sums using K-map   5

      i) F=A'B'D' + A'CD +A'BC

          d=A'BC'D + ACD +AB'D'

   b) State and verify De-Morgan's theorem for two variables using truth table.   5

   c) Write down the differences between combinational logic and sequential logic.   5

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3. a) Use Boolean theorems and postulates to simplify the following function and realize the simplified form using NAND gates only.   7

$F = AB + A'C + BC$

b) Design a code converter circuit which converts 3 bit Code to GRAY CODE and draw the logic diagram.   8

OR

Design a 3 bit odd parity generator and 4 bit parity checker using exclusive gates.

4. a) What do you mean by DE-Multiplexer? Implement the following Boolean function $F(w, x, y, z) = \sum_m (1, 2, 5, 7, 11, 15)$ using 8 to 1 Multiplexer with w, x, y as selection lines S_2, S_1 and S_0 respectively.   4

b) Implement the following functions using ROM.   4

$F_1(X,Y) = \sum(0,2,3)$

$F_2(X,Y) = \sum(1,2)$

c) A combinational circuit is defined by the function   7

$F_1(X,Y) = XY' + XZ$ and $F_2(X,Y) = XZ + YZ$

Implement the circuit with a PLA having three inputs, three product terms and two outputs.

5. a) Explain JK Flip with its logic diagram, truth table and characteristics equation.   5

b) Use 'D' flip-flop to design a 3-bit Synchronous UP Counter.   5

c) Convert the JK Flip flop to realize D Flip flop.   5

6. a) A sequential circuit with two D Flip flops, A and B; two inputs, x and y; and one output, z, is specified by the next state and output equations: 8

$A(t+1) = x'y + xA$

$B(t+1) = x'B + xA$

and $z = B$
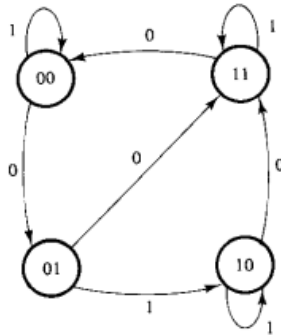
i) Draw Logic diagram of the circuit.   7

ii) Derive state table

iii)   Draw state diagram

OR

Draw the sequential circuit from the information provided in the state diagram in the figure below using D flip-flops.

b)   Design a 4-bit arithmetic circuits which performs eight different arithmetic operations.

7. Write short notes on: (**Any Two**)   2×5

a)   Output Hazard

b)   RAM

c)   Shift Register