Total number of printed pages:02 **D/3rd Semester/DECE303**

2023

DIGITAL ELECTRONICS

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) Convert the following hexadecimal numbers to their binary and decimal equivalents: 4+4=8

   (i) $(A23)_{16}$ (ii) $(7D)_{16}$

   b) State De Morgan's theorem. Write the Boolean equation for the circuit given in Figure-1. Simplify the equation and draw the simplified logic circuit using basic gates. 3+5=8

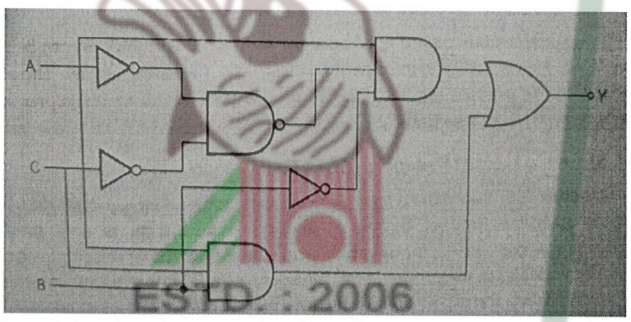

Figure-1

   c) Simplify the following expressions: 2+2=4

   (i) $(X + Z)(X + X\bar{Z}) + XY + Y$

   (ii) $\bar{A}(A + BC) + (AC + \bar{B})$

2 a) What do you mean by universal gate? Realize the following function using NAND gates only: $(A + \bar{B}C) + (C + AB)$ 2+4=6

   b) Reduce and implement the following function using K-map: 6

   $F(A,B,C,D) = \sum m(2,3,6,7,8,9,12,13) + \sum d(4, 10, 11)$

   c) What is multiplexer? Describe the operation of 8:1 multiplexer. 2+6=8

3. a) What is code converter? Implement the following combinational logic circuits using multiplexer: 2+4+4=10

(i) Half-adder (ii) Half-subtractor

b) Design a combinational circuit has four inputs and one output. The output is equal to 1 when: (A) all the inputs are equal to 1, (B) none of the inputs are equal to 1, and (C) odd number of inputs are equal to 1. 10

(i) Obtain the truth table. (ii) Find the simplified output function in sum of products form. (iii) Find the simplified output function in products of sums form. (iv) Draw the logic diagram for sum of products equation in (ii).

4. a) What is triggering? Draw the logic circuit of S-R flip-flop using D flip-flop. 2+6=8

b) What is race around condition? How does it get eliminated in a Master-slave J-K flip-flop? Explain. 2+6=8

c) What is the difference between truth table and excitation table? 4

5. a) What is Lockout condition? Design and implement a Mod-6 synchronous counter using J-K flip-flop. 2+6=8

b) Design a Mod-4 up/down counter. 6

c) Design a sequence generator to generate the sequence 0→2→5→4→7 and avoid lockout condition using J-K flip-flops. 6

6. a) Design a Mod-9 ripple counter using T flip-flop and draw the output waveforms. 6

b) What is ROM? Explain the classification of memory chips. Differentiate static RAM and dynamic RAM. 2+7+5=14

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