

II B.Tech I Semester Regular Examinations, March-2021
DIGITAL CIRCUITS AND LOGIC DESIGN
 (Common to ECE, CSE and IT)

Time: 3 Hours

Max. Marks: 60

Note: Answer ONE question from each unit (5 ×12 = 60 Marks)

~~~~~

**UNIT-I**

1. a) Obtain X and Y from (i) and (ii), respectively [4M]  
 (i)  $(AAAA.AA)_{16} = (X)_8$       (ii)  $(212212)_3 = (Y)_6$
- b) Let  $A=(11101111)_2$  and  $B=(00010001)_2$  are represented in 2's complement form [8M]  
 by using 8-bits, perform the following operations on A and B and represent the result using 16-bits.  
 (i)  $A+B$  (ii)  $A-B$  (iii)  $A*B$  (iv)  $A/B$ .

**(OR)**

2. Provide 16 basic distinct identities of Boolean Algebra. [12M]

**UNIT-II**

3. a) Simplify the following logic function using Quine-McCluskey minimization [6M]  
 technique.  
 $F(A,B,C,D,E) = \sum m(2, 4, 6, 8, 23, 25, 27, 29)$
- b) Simplify function  $F(A,B,C) = \sum m(1, 2, 4, 7)$  and implement using NAND gates. [6M]

**(OR)**

4. Design a full subtractor circuit. Provide truth table, K-maps, Boolean [12M]  
 functions and logic diagrams.

**UNIT-III**

5. Design an efficient 64-bit adder using full adders. [12M]  
 If the delay of a full adder is 2 units, then calculate delay of your design.

**(OR)**

6. a) Write differences between ROM and PROM [4M]
- b) Implement  $F(A,B,C,D,E) = \sum m(0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30)$  [8M]  
 using PROM and explain its procedure?

**UNIT-IV**

7. a) Draw the logic diagram of a D-Latch using NAND gates. Explain its Operation [6M]  
 using excitation table?
- b) Draw and explain 4-bit bi-directional shift register [6M]

**(OR)**

8. a) Explain the difference between sequential and combinational circuits? [6M]
- b) Design a Modulo-4 ripple counter? [6M]

**UNIT-V**

9. a) Obtain the state table and state diagram for a sequence detector to recognize two consecutive zeros or ones. [7M]
- b) How the Mealy is different from the Moore machine? [5M]

**(OR)**

10. Derive circuit that realizes the FSM defined by the state assigned table below [12M] using JK flip flops.

| PS | NS, Z |     |
|----|-------|-----|
|    | X=0   | X=1 |
| A  | B,0   | E,0 |
| B  | E,1   | D,0 |
| C  | D,0   | A,0 |
| D  | C,1   | E,1 |
| E  | B,0   | D,0 |

\* \* \* \* \*