**53 (IT 303) DGLD**

**2016**

# DIGITAL LOGIC DESIGN

Paper : IE 303

*Full Marks : 100*

Time : Three hours

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

*Answer* ***any five*** *questions.*

1. *(a)* Write down BCD & Ex-3 code of 562. 2

   *(b)* Convert $(1011{\cdot}01)_2$ to Decimal. 1

   *(c)* State De-Morgan's Law. 2

   *(d)* Define Minterm. 2

   *(e)* Why NAND, NOR Gates are called universal gate ? 2

   *(f)* Use only NOR Gate to realize AND function. 2

   *(g)* Use K-map method to simplify $f(w,x,y,z) = \sum m(0,1,3,5,9,10,11,12,13)$ 5

(h) Prove that $a+bc=(a+b)(a+c)$ 4

2. (a) Simplify using Boolean algebra

$$Y=f(x,y,z)=x'yz+xy'z'+x'y'z+xyz+x'y'z'$$

3

(b) Use basic gates to realize $Y=(a+b')cd+a'bc'$ 2

(c) Design a Full Subtractor. 5

(d) Convert $(F23E{\cdot}E1)_{16}$ to Binary. 1

(e) Draw block diagram of a 2 bit ripple carry adder and explain its addition operation. 2+3=5

(f) Use NAND Gate only to implement $Y=a'+b'c$ 3

(g) Convert $(F20{\cdot}I)_{16}$ to Decimal. 1

3. (a) Design a 8:1 Multiplexer. 5

(b) Distinguish between Decoder and Encorder. 2

(c) How many control lines are needed to design a 16:1 Multiplexer ? 1

(d) Convert $(71)_8$ to decimal. 1

(e) Use K-map method to simplify into product of sum form

$f(w,x,y,z) = \pi M(0,2,3,4,9,10)$ 5

(f) Draw the circuit diagram of a S-R latch and explain its truth table. 4

(g) Draw the block diagram of 2 bit connter. 2

4. (a) Simplify using Boolean algebra

$Y = (a+b+c')\ (a+b+c)\ \overline{(a+b)}$ 3

(b) What do you mean by don't care conditions and how don't care conditions help to simplify Boolean function using K-map method ? 1+2=3

(c) Explain the truth table of J-K latch. 4

(d) What are the main differences between sequential and combinational logic ? 3

(e) Perform subtraction using 2's complement method 1011 – 1100. 2

(f) What is race around condition ? 2

(g) Perform addition and division 1·5×2=3

(i) 1111 + 1111

(ii) 101010 ÷ 10

5. *(a)* Design a Mod-5 Counter. 10

*(b)* Explain the operation of a 3 bit register with its block diagram.6

*(c)* Define Quad and Octet. 2

*(d)* State commutative law of Boolean algebra. 2

6. *(a)* Design a 4 bit Binary to Gray converter. 5

*(b)* Describe the operation of a 2 bit synchronous counter with timing diagram. 8

*(c)* Simplify using Boolean algebra.

$Y = xy + \overline{xyz} + \overline{xy}$ 2

*(d)* Explain the operation of M-S D-Flip Flop. 5

7. *(a)* Design a BCD adder. 12

*(b)* Write down the Excitation tables for J-K Flip Flop, D Flip Flop, S-R Flip Flop. 6

*(c)* Draw the circuit diagram of D-latch. 2