53 (IT 303) DLDG

2018

DIGITAL LOGIC DESIGN

Paper : IT 303

Full Marks : 100

Time : Three hours

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

*Answer **any five** questions.*

1. *(i)* Write down whether the following statements are *True/False* : 1×10=10

   (a) Hexadecimal 1F converted to binary is 00011100.

   (b) Karnaugh maps can be used to simplify to boolean function.

   (c) BCD code of 54 is 101100.

   (d) The 2's complement of the binary number 1001 is 1110.

   (e) 1+1+1 =10.

(f) Octal 71 converted to binary is 01110001.

(g) $1 \oplus 1 \oplus 1 = 1$.

(h) $A + AB = A$.

(i) $A + B = B + A$ is an example of Commutative Law.

(j) 1000 – 100 = 0100.

(ii) Simplify using boolean algebra : 1×4=4

(a) $A + A'B$

(b) $A + AB'C'D$

(c) $\overline{AB} + AB$

(d) $\overline{AB} + \overline{AB}$.

(iii) Simplify the below boolean function F using Karnaugh map method. 6

$$F(w, x, y, z) = \sum m(0, 1, 3, 5, 6, 8, 9, 10, 11, 12)$$

2. (a) Design a Full Adder. 5

(b) Convert the below function into Canonical form :

$$f(x, y, z) = x' + yz.$$ 3

(c) Use only NOR gate to implement Complementary AND, OR functions. 6

(d) Design a 4:1 multiplexer. 6

3. (a) Draw the logic circuit of S-R latch and explain its function with truth table. 2+4=6

(b) Explain the truth table of 2-K latch along with its logic diagram. 5

(c) Write few important differences between Sequential and Combinational circuits. 3

(d) Use basic gates only to implement the below boolean function. 4

$$Y = f(a, b, c) = ab'c + (a' + b)(c' + d')$$

(e) Use only NAND gate to implement $Y = AB$. 2

4. (a) Describe the operation of a Master Slave DFF with block diagram. 6

(b) Simplify the below function using K-map method : 6

$$f(A, B, C, D) = \sum m(0, 1, 2, 3, 4, 5, 7, 8, 9, 11) + d(6, 12)$$

(c) Draw the block diagram of a 3-bit ripple carry adder. 2

(d) Write down the truth table of a 1 : 4 de-multiplexer. 2

(e) Describe the operation of a 2-bit register. 4

5. (a) Convert the following : 1×8=8

(i) $(F1F)_{16} = (\text{—})_2$

(ii) $(A1A)_{16} = (\text{—})_2$

(iii) $(1001)_2 = (\text{—})_{10}$

(iv) $(F1)_{16} = (\text{—})_{10}$

(v) $(23)_{10} = (\text{—})_2$

(vi) $(42)_8 = (\text{—})_{10}$

(vii) $(24)_8 = (\text{—})_2$

(viii) $(A1)_{16} = (\text{—})_{10}$

(b) State and prove De Morgan's law. 6

(c) Explain the operation of a 1-bit comparator. 4

(d) Draw the block diagram of a 8 : 1 Multiplexer. 2

6. *(a)* Explain the operation of a 2-bit asynchronous counter with block diagram, timing diagram. 12

(b) Explain the operation of a 2 to 4 Decoder. 6

(c) Draw the block diagram of a 16 : 1 Multiplexer. 2

7. *(a)* Design a Mod-5 counter using J-K flip-flop. 12

(b) Distinguish between : 2×3

(a) Excitation table and Truth table

(b) Encoder and Decoder

(c) Multiplexer and Demultiplexer.

(c) Use 2's complement method to subtract 1001 – 0101. 2