B.Sc. ELECTRONICS
Third Semester
DIGITAL ELECTRONICS
(BSE - 11)

Duration: 3Hrs. **Full Marks: 70**

Part-A (Objective) =20
Part-B (Descriptive) =50

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins. **Marks: 50**

Answer any *five* of the following questions:

1. **Answer the following:** (2+2+3+3=10)

   a) Divide $(101101)_2$ by $(110)_2$.

   b) Realize an OR gate using a) NAND gate and b) NOR gate.

   c) Convert the octal number $(74213)_8$ to hexadecimal equivalent number.

   d) Simplify the Boolean expression:

   $$\overline{\overline{A\bar{B} + ABC} + A(B + A\bar{B})}$$

2. **Answer the following:** (2×5=10)

   a) Give the BCD code for the decimal number (874).

   b) Convert $(643)_{10}$ into its Excess-3 code.

   c) Convert the Gray code (1011001) to binary number.

   d) Simplify the expression: $AB+\overline{AC}+A\bar{B}C(AB+C)$

   e) Convert the binary number $(10101101)_{10}$ to its Gray code.

3. **Answer the following:** (3+3+4=10)

a) Prove the following Boolean expression:

1. $(A+B)(\bar{A}\bar{C}+C)(\overline{\bar{B}+AC})=\bar{A}B$
2. $\bar{A}\bar{B}\bar{C}+\bar{A}\bar{B}C+\bar{A}B\bar{C}+\bar{A}BC+AB\bar{C}=\bar{A}+\overline{B+C}$

b) Describe the NOR gate. Specify its symbol and write its truth table.

4. **Answer the following:** (3+2+3+2=10)

a) Convert the hexadecimal number $(2AF.31)_{16}$ to its decimal equivalent.

b) Represent -44 in 2's complement form using 8-bits.

c) Represent -77.25 in 8 bit 1's complement form.

d) What is De Morgan's theorem?

5. **Answer the following:** (2+8=10)

a) What is encoder?

b) Write short notes on the following: (any *two*)

1. Timer IC 555
2. R-2R ladder network.
3. Shift Registers.

6. **Answer the following:** (2+4+4=10)

a) Design a full adder using half adders and OR gate.

b) Minimize the following function using K-map.

1. $F(A,B,C,D)=A\bar{B}C\bar{D}+\bar{A}\bar{B}CD+ACD+A\bar{B}D+AD+\bar{A}B\bar{C}$
2. $F(A,B,C,D)=\sum m(1,3,5,8,9,11,15)+d(2,13)$

7. **Answer the following:** (3+3+4=10)

a) Design a full subtractor from the truth table.

b) Design a 1x4 demultiplexer.

c) Explain the principle of operation of S-R flip-flop.

8. **Answer the following**: (5+3+2=10)

a) Give the characteristic table, excitation table and the state diagram of J-K flip-flop.

b) Design a 4x16 decoder using 2x4 decoders.

c) Design a 4x1 MUX.

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Duration: 20 minutes **Marks – 20**

(PART A- Objective Type)

I. Choose the correct answer: **1×20=20**

1. Radix of binary number system is___?
   A) 0 B) 1 C) 2 D) A &B

2. A group of four bits is known as
   A) bit B) byte C) nibble D) word

3. 1's complement representation of decimal number of -17 by using 8 bit representation is
   A) 11101110 B) 11011101
   C) 11001100 D) 00010001

4. The Gray code for decimal number 6 is equivalent to
   A) 1100 B) 1001 C) 0101 D) 0110

5. The binary equivalent of octal number (367.52) is
   A) 010101111.101010 B) 011110111.101010
   C) 111100111.101010 D) 111110111.101010

6. The hexadecimal number 'A0' has the decimal value equivalent to
   A) 80 B) 256 C) 100 D) 160

7. The NAND gate output will be low if the two inputs are
   A) 00 B) 01 C) 10 D) 11

8. De Morgan's first theorem shows the equivalence of
   A) OR gate and Exclusive OR gate B) NOR gate and Bubbled AND gate
   C) NOR gate and NAND gate D) NAND gate and NOT gate

9. If X,Y and Z are Boolean variables, then the expression $X(X+\bar{X}Y)\ Z(X+Y+Z)$ is equal to
   A) $X+\bar{X}Y$ B) X+Y+Z C) XYZ D) XZ

10. The simplified form of a logic function $Y=AB+\bar{A}+\bar{B}$ is
    A) AB B) $\bar{A}+\bar{B}$ C) 1 D) 0

11. How many two –input AND and OR gates are required to realize Y=CD+EF+G?
    A) 2,2 B) 2,3 C) 3,3 D) none of these

12. Which of the following is a universal gate?
    A) AND B) NAND C) OR D) NOT

13. A full adder logic circuit will have
    A) Two inputs and one output
    B) Three inputs and three outputs
    C) Two inputs and two outputs
    D) Three inputs and two outputs

14. The gates required to build a half adder are
    A) Ex-OR gate and NOR gate
    B) Ex-OR gate and OR gate
    C) Ex-OR gate and AND gate
    D) Four NAND gates

15. How many select lines will a 16 to 1 multiplexer will have
    A) 4 B) 3 C) 5 D) 1

16. One example of combinational circuit is
    A) Adder
    B) Counter
    C) Shift register
    D) Flip-flop

17. One example of sequential circuit is
    A) Flip-flop
    B) Half adder
    C) Full adder
    D) Subtractor

18. In a JK flip-flop, toggle means
    A) Set Q=1 and $\bar{Q}$=0
    B) Set Q=0 and $\bar{Q}$ =1
    C) Change the output to the opposite state
    D) No change in output

19. A ring counter consisting of five flip-flops will have
    A) 5 states
    B) 10 states
    C) 32 states
    D) infinite state

20. The binary equivalent of decimal number (10) is
    A) 1010 B) 0101 C) 0011 D) 0010

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