Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/BCA/SEM-1/BCA-101/2010-11

2010-11
DIGITAL ELECTRONICS

Time Allotted : 3 Hours *Full Marks :* 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) In which of the following base systems is 789 not a valid number ?

      a) Base 5

      b) Base 16

      c) Base 8

      d) Base 3.

   ii) Storage of 1 kB means the what number of bytes ?

      a) 1000 b) 964

      c) 1024 d) 1064.

iii) Pick out the correct statement :

a) In a positional number system, each symbol represents the same value irrespective of its position

b) The highest symbol in a position number system is a value equal to the number of symbols in the system

c) It is not always possible to find the exact binary

d) Each hexadecimal digit can be represented as a sequence of three binary symbols.

iv) The binary code of $(21.125)_{10}$ is

a) 10101.001 b) 10100.001

c) 10101.010 d) 10100.111

v) Race condition is avoided by

a) J-K flip-flop b) S-R flip-flop

c) master-slave flip-flop d) none of these.

vi) Which one is sequential circuit ?

a) multiplexer b) decoder

c) priority encoder d) counter.

vii) Which is correct ?

a) $A+\overline{A}B=A+B$ b) $A+1=A$

c) $A+\overline{A}=A$ d) $\overline{A}/A=A$

viii) Decimal digits can be converted to binary code using

a) Decoder b) Encoder

c) Mux d) DeMux.

ix) Carry of a full adder is a

a) dual function

b) self dual function

c) non-symmetric function

d) none of these.

x) Every flip-flop is defined by

a) characteristic equation

b) excitation table

c) both of these

d) none of these.

xi) Immediate Access Storage Device is the name of

a) primary memory b) secondary memory

c) hard disk d) pen drive.

xii) Control unit does not process data.

a) False b) True

c) Unpredictable d) None of these.

xiii) If there are three inputs then the number of input combinations will be

a) four b) eight

c) six d) two.

xiv) Excess-3 Code representation of decimal 59 is

a) 01100110 b) 10001100

c) 01011001 d) 11000110.

xv) Hexadecimal equivalent of $(26.25)_{10}$ is

a) A6.4 b) 1A.4

c) FA.4 d) 1A.25

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Implement XOR operation using four 2-input NAND gates. Verify the output for different combinations of inputs.

3. Write down the BCD code of $(9612)_{10}$. Add two numbers $(6952)_{10}$ and $(1589)_{10}$ using BCD codes and obtain the result also in BCD.

4. a) Find out the dual and the complement of the following Boolean function :

$$F = ABC + \overline{A}\,\overline{B}C + \overline{A}BC + AB\overline{C}$$

b) Simplify the following Boolean expression

$$(X+Y)\left(\overline{X}+Y+Z\right)\left(\overline{X}+Y+\overline{Z}\right)$$

to minimum number of literals using algebraic method.

5. a) Prove that the multiplexer is a universal logic module.

b) Use 4-to-1 MUX and other necessary logic gate to design a full-subtractor.

6. a) What is the advantage of JK flip-flop over SR flip-flop ?

b) Write the Maxterm form of the following function :

$$F = XY + \overline{X}Z$$

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Draw the truth table for a three input adder. Explain clearly the meaning of the input and the output symbols in the truth table. Write the Boolean expressions for the sum and carry. 5

   b) Use a Karnaugh map to find the minimum sum of products for the expression $X = A'B'C + AB'C + A'BC + ABC'$ 5

   c) Simplify the following expressions using Boolean algebra : 5

      i) $AB + A(B+C) + B(B+C)$

      ii) $A'BC + B'CD + AC + A'B'CD'$

8. a) State the main differences between sequential and combinational circuits. 2

   b) Draw the truth table and logic circuit of a Full Subtractor. Using Karnaugh map find out the expression for difference (D) and borrow (B). 4 + 3

   c) Implement the Boolean function $F = (A, B, C, D) = \sum(0, 1, 3, 4, 8, 9, 15)$ using 8×1 multiplexer with A, B and D connected to select lines s_2, s_1, s_0 respectively. 6

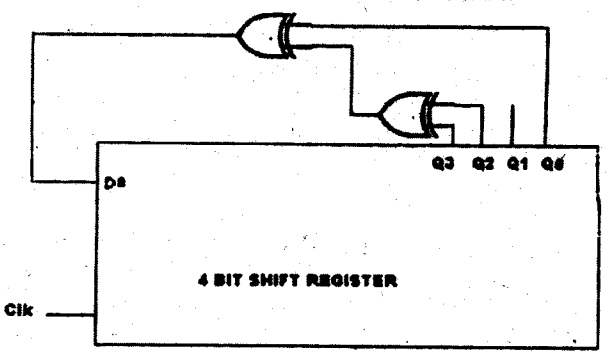
9. a) Define flip-flop and its propagation delay. 4

b) Using the logic diagram convert a J-K flip-flop to a *D* flip-flop and *T* flip-flop. 5

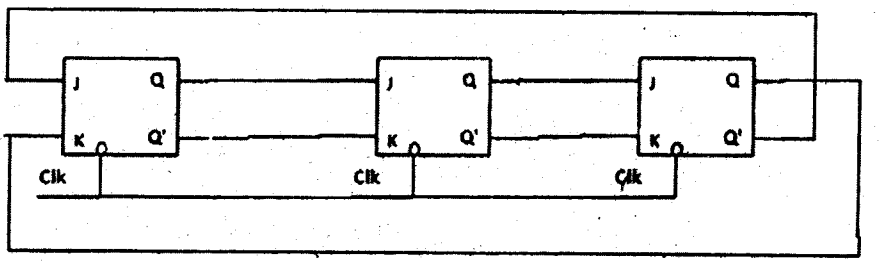
c) Design a J-K master-slave flip-flop with circuit diagram and give the truth table. 6

10. a) What is the usefulness of excitation table of the flip-flop ? 3

b) The 4-bit shift register is initialised to 001. After how many clock pulses is the register re-initialied to same value ? 6



c) Determine the modulus of the following counter. 6



11. Write short notes on any *three* of the following : 3 × 5

a) Decoder

b) Shift register

c) PROM

d) Priority Checker

e) Ring counter.