Q.11 a) Explain D and T- type flip-flop in detail. 5

b) What is Counter ? Draw and explain 4-bit Ripple counter with its timing diagram. 6

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First Year B.C.A. (Semester - I) Examination
Paper - 15BCA103
Digital Techniques

Time : Three hours]   [Full Marks - 60

N.B. :
  i) All questions carry equal marks
  ii) Due credit will be given to neatness & adequate dimensions.
  iii) Assume suitable data wherever necessary.
  iv) Diagrams & Equations should be given wherever necessary.
  v) Use Blue/Black ink/refill only for writing the answer book.

Q.1 Solve using correct options. 5

a) The base of hexadecimal number system is _____
  i) 2   ii) 4
  iii) 8   iv) 16

b) $A + A =$ _____
  i) A   ii) B
  iii) 1   iv) 0

c) A quad contains group of _____ adjacent one's or zero's in K-map.
  i) 2   ii) 3
  iii) 4   iv) 8

d) A half- adder circuit construct using AND and _____ gate.
  i) OR   ii) Ex-OR
  iii) NOT   iv) Ex-NOR

e) Decade counter , count the maximum _____ number of states.
  i) 4   ii) 5
  iii) 8   iv) 10

Q.2 a) Convert the following number to decimal.   6
    i) $(1101.11)_2$ ii) $(2F.A)_{16}$

    b) Perform following subtraction using one's and two's complement method.   5
    i) $(11101)_2 - (10010)_2$

OR

Q.3 a) Convert following decimal no. to an equivalent binary number.   6
    i) $(16)_{10}$ ii) $(45)_{10}$ iii) $(25)_{10}$

    b) Solve the following.   5
    i) $(101110 + 011011)$ ii) $(1100 - 0110)$

Q.4 a) Explain OR, AND and NOT gates with logic symbol and truth table.   5

    b) Prove associative and commutative laws of Boolean algebra with the help of truth table.   6

OR

Q.5 a) Prove that,   4
    i) $A + BC = (A + B). (A + C)$
    ii) $A + \overline{A}.B = A + B$

    b) Write any four duality theorems in boolean algebra.   2

    c) Explain NAND and NOR gate with logic symbol, truth table and logic equation.   5

Q.6 a) Draw 2 variable, 3 variable and four variable K-map.   5

    b) What are Pair, Quad and Octet in K-map ? Explain with example.   6

OR

Q.7 a) Convert following SOP equation into standard SOP equation.   4
    i) $Y = A\overline{B} + BC + A\overline{C}$
    ii) $Z = \overline{X}Y + \overline{W}.\overline{Y} + X.Z$

    b) What is K-map ?   2

    c) Minimize the following function using K-map and realize it using NAND gates only.   5
    $f(A,B,C,D) = \sum m(0,2,4,6,8,9,10,11,12,14)$

Q.8 a) Construct and explain full adder circuit with two half adder circuit.   5

    b) What is Multiplexer ? Explain 4:1 multiplexer with logic diagram and truth table.   6

OR

Q.9 a) Explain Half subtractor with logic diagram and truth-table.   4

    b) What is Encoder ?   2

    c) What is Demultiplexer ? Explain 1:4 demultiplexer with logic diagram and truth table.   5

Q.10 a) Draw the logic diagram of clocked RS Flip-Flop and explain its working Truth- Table.   5

    b) Explain decade counter with logic diagram and Truth-Table and timing diagram.   6

OR