Q. P. Code : 30238

(2½ Hours) [Total Marks: 75]

N. B.: (1) **All** questions are **compulsory**.
(2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.
(3) Answers to the **same question** must be **written together**.
(4) Numbers to the **right** indicate **marks**.
(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **Non-programmable** calculators is**allowed**.

1. **Attempt _any three_ of the following:** **15**
a. Convert:
    i) $(23)_{10} = (?)_2$ 2
    ii) $(34)_{16} = (?)_{10}$ 2
    iii) $(555)_8 = (?)_2$ 1
b. Convert :
    i) $(101100)_2 = (?)_{gray}$ 2
    ii) $(456)_{10} = (?)_{bcd}$ 2
    iii) $(64)_{10} = ( )_{excess\ 3}$ 1
c. Write a short note on different techniques of binary subtractions   5
d. Solve :
    i) $(1011011)_2 - (10010)_2 = (?)_2$ 2
    ii) $(101101)_2 + (11001)_2 = (?)_2$ 3
e. Solve :
    i) $(67)_8 + (70)_8 = (?)_8$ 3
    ii) $(331)_8 = ( )_2 = (?)_{16}$ 2
f. Solve :
    i) $(ABC)_{16} + (89)_{16} = (?)_{16}$ 3
    ii) $(FA)_{16} - (45)_{16} = (?)_{16}$ 2

2. **Attempt _any three_ of the following:** **15**
a. Describe the AND gate and the XOR gate with the symbol, the logical statement, the boolean expression and its logical circuit diagram.
b. State and proof DeMorgans Law.
c. Solve the following
    i) Simplify : $\overline{(A * B)} * (\overline{A} + B) * (\overline{B} + B)$
    ii) Simplify : $(A + C)(AD + AD) + AC + C$
d. Describe how NAND gate is used to build the NOT, OR and AND gates
e. Derive the SOP of the following expression using K- Maps and draw the logical diagram
    $F(W,X,Y,Z) = \Sigma m((0,2,5,8,10,13)$
f. Derive the POS of the following expression using K- Maps and draw the logical diagram
    $F(A,B,C,D) = \Pi M(0.2.3.4,8,12)$
    $F(A,B,C,D) = \Pi M(0.2.3.4,8,12)$

3. **Attempt _any three_ of the following:** **15**
a. What is a combinational circuit? Build a combination circuit of a half adder.
b. With the help of K-Maps build a 3- bit full adder and describe it working.
c. Describe the working of 2 bit half subtractor.

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d. Describe the working of an4 bit adder subtractorwith a tristate inverter
e. Describe the working of a multiplier
f. What is a Comparator? Explain .

4. Attempt _any three_ of the following: **15**
a. Draw the logical circuit diagram and describe the working of a 4:1 multiplexer
b. Draw the logical circuit diagram and describe the working 1: 4 demultiplexer
c. Differenciate between encoders and decoders
d. Describe with a truth table the working of Clocked Set – Reset flip flop.
e. Describe with a truth table the working of JK flip flop.
f. What is race around condition? How can it be handled?

5. Attempt _any three_ of the following: **15**
a. Write a short note on type of counters .
b. Draw a logical diagram and describe working of 4 bit binary counter.
c. Describe the functioning of a presettable counter
d. Write a short note on shift registers .
e. Describe with a timing diagram the working of a 4 bit ring counter.
f. What is the funtion of a psudo random binary sequencegenerator .

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