Q.P. Code :00904

[Time: $2\frac{1}{2}$ Hours] **[Marks:75]**

Please check whether you have got the right question paper.

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

Q.1 Attempt any three of the following: (15)

a. Define digital signal. With expect to digital signal explain the terms – digits and bits. Also discuss active high and active low signal.

b. What are different numbering system used? Convert following numbers to required numbering system.
(i) $(11001011.01110)_2 = (?\ )_{10}$
(ii) $(1100110.011010)_2 = (\ ?\ )_{16}$

c. What are codes? Where are they used? Differentiate between weighted and non-weighted codes. Give one example of each.

d. Explain how negative numbers are represented in binary numbering system. Discuss properties of 2's complement.

e. Perform following arithmetic operations after converting the numbers to binary numbering system -
(i) $(10)_{10} \div (4)_{10}$
(ii) $(727)_8 - (234)_8$
(iii) $(DADA)_{16} + (BABA)_{16}$

f. Add following BCD numbers
(i) $(56)_{10}$ and $(23)_{10}$
(ii) $(82)_{10}$ and $(34)_{10}$

Q.2 Attempt any three of the following: (15)

a. Draw logic circuit and make truth table to prove the following Boolean theorems-
i) A . 0 = 0
(ii) (A .B) . C = A. (B. C)

b. Using rules of Boolean algebra, solve y = (x + z) (x' + y +z). Draw a logic circuit using suitable gates to implement the simplified equation.

c. What is meant by universal logic gate? Draw logic circuits showing construction of Ex-OR gate using NAND gate and using NOR gate

d. F(A,B,C,D) = $\sum m\ (0,1,2,5,13,15)$. Draw k-map and find minimized Boolean expression

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e. What is meant by don't care conditions? Explain how are they used in simplifying an expression using a k-map. Use the following example-

F(A,B,C,D) = $\sum m\ (1,4,8,12,1315) + d(3,14)$

f. What are disadvantages of k-map? Explain the Q- M method. Discuss the terms 'prime impeccant', 'code word' and 'reduction table'.

Q.3 Attempt <u>any three</u> of the following: (15)

a. A 4 bit binary number is represented by $A_3A_2A_1A_o$ where $A_3A_2A_1$ and A_o represent the individual bits with A_o equals to the bits with A_o equal to the LSB. Design a logic circuit that will produce a HIGH output whenever binary number is greater than $(0010)_2$ and less than $(1000)_2$.

b. Convert 4 bit binary to 4 bit gray. Draw the truth table, necessary k-maps and logic circuit.

c. Design a BCD TO 7 segment decoder. Realize the circuit using NAND gates only.

d. Implement 8 bit adder 4 bit full adder.

e. Draw circuit and explain working of BCD sub tractor.

f. Write a note on fast multiplier.

Q.4 Attempt <u>any three</u> of the following: (15)

a. Implement following function using 8:1 Mux
F(A,B,C,D) = $\sum$ M (2,4,5,7,10,14)

b. What are data distributor (demultiplexer)? Explain basic operation of 2 output demultiplexer.

c. Draw block dig and explain operation of 74180 monolithic 8 bit checker/ generator.

d. Explain the need of preset and clear pins in RS flip flop? With neat block dig and truth table explain the working of RS flip flop.

e. Write a note on master slave JK flip flop.

f. Discuss various applications of flip flops.

Q.5 Attempt <u>any three</u> of the following: (15)

a. Explain the working of Asynchrous / ripple counter.

b. Design mod – 4 regular sequential syschronous up counter using TFF.

c. Write truth table for mod 6 counter in IC 7492.

d. Explain the difference between serial shifting and parallel shifting of data in shift register.

e. Explain how sequence generator circuit works. Explain with one example.

f. Write a note on ring counter.