FYBSc.IT/Digital signal/100

D E Sem-I

Q. P. CODE : 750202

(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:**
a. What is analog signal? Explain frequency, amplitude with respect to analog signal.
b. Encode the following decimal number in binary number system.
    i)25.45   ii)134
c. Express the 10101100 BCD code into Grey code and also in Excess-3 code.
d. i) Perform the subtraction using 1's complement method.
    11011 – 10100
    ii) Perform the addition of given binary numbers.
    1000011 + 1110001
e. Write a short note on HOLLERITH code.
f. i) Convert 45 from octal number into decimal.
    ii) Convert 9A from hexadecimal number into decimal.
    iii) Convert 46.23 from decimal to binary.

2. **Attempt _any three_ of the following:** 15
a. For the logic expression Y=AB'+A'B. Obtain the truth table, name the gate and operation performed and symbol for it also realize this using AND,OR,NOT gates.
b. Prove the given Boolean expression using Boolean laws and draw the circuit for it using NAND gate only.
    A.B +A'B + A'B' = A' + B
c. State and prove De-Morgan's theorem and realize it using basic gates.
d. Realize the given Boolean expression using NOR gate only.
    Y= (A'+B+C) . (A+B'+C') . (A'+B'+C') . (A'+B+C')
e. Using Karnugh's map simplify the following SOP function and implement it with basic gates. F(A,B,C,D) = (2,3,6,7,8,10,11,12) +d(14,15)
f. Obtain product of sum expression for the following function and implement it using NOR gates. F(P,Q,R,S) = (1,3,4,5,6,7,12,13)

3. **Attempt _any three_ of the following:** 15
a. What is full adder? Draw logic circuit diagram and explain it.
b. Design BCD to Excess -3 code converter.
c. With the help of IC 7483 block diagram explain BCD adder.
d. Describe Half subtractor with help of circuit diagram and truth table.
e. What is comparator circuit? Discuss detail working of it.
f. Design and implement Binary to Gray code converter circuit.

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4. **Attempt _any three_ of the following:**   15

a Draw logic circuit diagram of D flip flop and explain its working.

b Discuss clocked S-R flip flop using four NAND gates.

c How JK flip flop is derived from S-R flip flop? Explain.

d Write a short note on Multiplexer.

e With the help of two 4:1 multiplexer how can we build 8:1 multiplexer? Explain.

f Explain the role of ALU as a part of computer system.

5. **Attempt _any three_ of the following:**   15

a. Explain the operation of SIPO shift register.

b. Design a synchronous decade counter using D flip flops.

c. Explain the working of Johnson counter.

d. Draw a schematic diagram of 4-bit bi-directional shift register using R-S flip flops and explain its working.

e. For the logic circuit shown, draw the timing diagram of CP, Q_2 and Q_1 assuming the initial conditions $Q_2 = Q_1 = 0$.
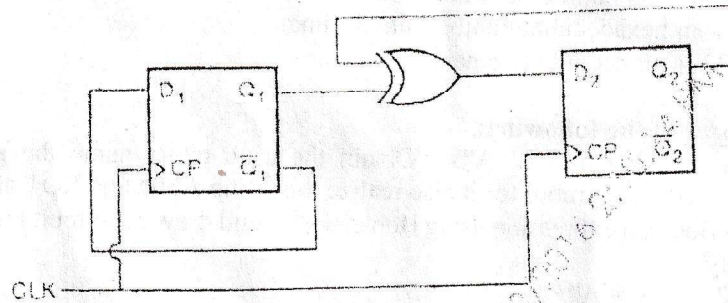
f. Design a ripple counter for the states shown below: