2025

ELECTRONICS AND COMMUNICATION TECHNOLOGY

Paper : ECT0200104

(Digital Electronics)

Full Marks : 45

Time : Two hours

The figures in the margin indicate full marks for the questions.

1. Answer the following questions : 1×5=5

Choose the correct answer :

(i) Convert (110100011) to its octal

(a) $(431)_8$

(b) $(643)_8$

(c) $(611)_8$

(d) $(734)_8$

(ii) In a hexadecimal number system which digits are used ?

(a) 0 to 9 only

(b) 1 to 16 only

(c) 0 to 8 and *A* to *F*

(d) 0 to *F*

(iii) How many possible combinations of variables can be represented in a 3-variable K-map ?

(iv) What is counter ?

(v) Draw the logic diagram of JK flip-flop.

2. Write very short answer of the following questions : ***(any five)*** 2×5=10

(i) How do you convert decimal fraction 0·375 to its binary equivalent ?

(ii) What is the equivalent hexadecimal of $(3509)_{10}$?

(iii) Find the subtraction of the octal number 3752 from 7463 and express the sum in octal form.

(iv) Expand $\bar{A}+\bar{B}$ to minterms and maxterms.

Contd.

(v) $F(A, B, C, D) = \sum(0, 1, 4, 5, 7, 8, 9, 11, 12, 13, 15)$ minimize the function using K-map.

(vi) Draw the simplified logic diagram for the following expression :

$\bar{A}B + AB + \bar{A}\bar{B}$

(vii) Why a multiplexer is called a data selector ? Which Boolean function is implemented by a 4:1 MUX ?

(viii) Explain race condition is SR flip-flop.

(ix) What is synchronous and asynchronous counter ?

(x) Differentiate between RAM and ROM.

3. Answer the following questions : ***(any four)*** 5×4=20

(i) Design all the basic logic gates using NOR gate only.

(ii) Write fundamental theorem of Boolean algebra and draw the logic circuit diagram for *any one* of them.

(iii) Design a 4 to 16-line decoder using 3 to 8-line decoder.

(iv) Consider the following minterm expression of

$F(P, Q, R, S) = \sum(0, 2, 5, 7, 8, 10, 13, 15)$.

The minterms 2, 7, 8 and 13 are don't case term. Find the minimal SOP form of F.

(v) What is a subtractor circuit ? Design a full subtractor circuit.

(vi) Design 2-bit synchronous up counter with proper steps.

(vii) Explain the operation of weighted register DAC.

(viii) Draw the logic diagram of 2-bit binary down ripple counter and draw the timing diagram.

4. Answer the following questions : ***(any one)*** 10×1=10

(i) What is NOR gate ? How it is different from a universal gate like NAND ? Draw the logic circuit diagram to implement a XOR gate using only NOR gate. Simplify all the intermediate steps clearly. 1+2+7=10

(ii) Use a 4×1 MUX to implement the logic function $F(A, B, C) = \sum m(1, 2, 6, 7)$.

(iii) What is decimal to BCD encoder ? Write the truth table, boolean expression and logic diagram for the same. 2+2+2+4=10

(iv) What is 555 timer ? Explain the circuit diagram of 555 timer. Write *one* application of 555 timer and explain it. 2+5+3=10