

(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 the following.
 (i) $(1051.36)_{10} = (?)_8$
 (ii) $(F9A.D5)_{16} = (?)_{10}$
- b. What is Hamming code? A seven bit even parity hamming code is received as 1110101. What is the correct code?
- c. Certain number system has base 7. What is the hexadecimal equivalent of the minimum and maximum number that is expressed using the base 7 and four bits?
- d. Solve the following.
 (i) $(111000.01)_2 - (100111.00)_2$
 (ii) $(1010101)_2 \div (11)_2$
- e. Perform the following.
 (i) $(727)_8 + (234)_8$
 (ii) $(2C48)_{16} - (9AA)_{16}$ using 1C method
- f. Solve the following.
 (i) Convert the following number to BCD and add them $(11)_{10} + (9)_{10}$
 (ii) Convert the following number to XS-3 and subtract them $(53)_{10} - (28)_{10}$

2. Attempt any three of the following:**15**

- a. Reduce the following using Boolean laws and theorems.
 (i) $W\bar{X}(W + Y) + WY(\bar{W} + \bar{X})$
 (ii) $XY + \bar{X}\bar{Y}Z + (\bar{X}\bar{Y} + Z)$
- b. Write short notes on input bubbled AND gate and input bubbled OR gate.
- c. Prove the following.
 (i) $\bar{A}BC + A\bar{B}C + AB\bar{C} + ABC = AB + AC + BC$
 (ii) $(A + \bar{A}B)(C + \bar{D}) = \bar{A}\bar{B} + \bar{C}D$
- d. Simplify using K-map and realize it using minimum number of gates.
 $F(A,B,C,D,E) = \sum m(0,2,5,7,13,15,18,20,21,23,28,29,31)$
- e. Simplify using K-map and realize it using minimum number of gates.
 $F(A,B,C,D) = \prod M(4,6,8,9,10,12,13,14) + d(0,2,5)$
- f. Minimize expression using Quine Mc Cluskey method.
 $f(W,X,Y,Z) = \sum m(2,6,8,9,10,11,14,15)$

3. Attempt any three of the following:**15**

- a. The input to a combinational logic circuit is a 4-bit binary number. Design the logic circuit with minimum hardware for the following
 (i) Output Y1 = 1 if the input binary number is 5 or less than 5.
 (ii) Output Y2 = 0 if the input binary number is 9 or more than 9.
- b. Convert 4 bit gray to 4 bit binary. Draw the truth table, necessary k-maps and logic circuit.

- c. Draw circuit and explain working of XS-3 adder.
- d. Design the Full Subtractor using K-map. Draw the circuit diagram for the same.
- e. How Booths algorithm speeds up the multiplication process? Explain with an example.
- f. Design single bit magnitude comparator. Draw truth table, K-map and circuit diagram for the same.

4. Attempt any three of the following:

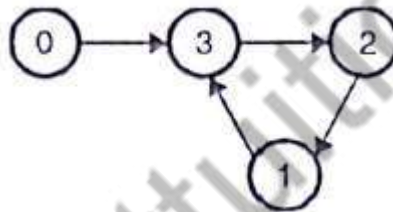
15

- a. Implement full adder circuit using 8:1 MUX.
- b. Cascade Demultiplexer. Build 1:8 demux using 1:4 demux chips.
- c. $Y = A + B + \bar{C}$. Realize using a multiplexer.
- d. Draw logic circuit diagram of D flip flop and describe with a truth table the working of it.
- e. How SR flip-flop can be used to work as T flip-flop? Explain.
- f. How flip-flop is used in eliminating keyboard debouncing? Explain.

5. Attempt any three of the following:

15

- a. Design modulo 6 ripple counter.
- b. Design 4 bit binary up/down counter with control input of up/down.
- c. Implement synchronous counter using JK FF for state diagram shown in figure.



- d. Write a short note on buffer register.
- e. Explain working of SIPO register.
- f. Write a short note on Johnson counter.