

Prelim Paper

Time: 3 Hrs.]

Logic Design

[Marks : 80

- N.B.:**
- (1) Question number 1 is compulsory.
 - (2) Solve any three questions out of remaining five questions.
 - (3) Assume suitable data if necessary.
 - (4) Figures to right indicate full marks.

1. Solve the following (any FOUR) : [20]
 - (a) Prove that NOR gate is a universal gate.
 - (b) Derive relation between α and β .
 - (c) Design full adder using half adder and additional gates.
 - (d) Convert D flip flop to T flip flop.
 - (e) Design EX-OR gate using only NOR gates.

2. (a) Using Quine Mc-Cluskey Method determine Minimal SOP form for [10]
 $f(A,B,C,D) = \sum m(0,1,3,7,8,9,11,15)$
(b) Implement following using only one 8:1 Multiplexer and few gates : [10]
 $f(A,B,C,D) = \sum m(1,2,3,5,6,9,10,11,14)$

3. (a) With neat logic diagram explain operation of 4-bit Bidirectional Shift Register. [10]
(b) Explain Collector to base bias Circuit with its stability factor. [10]

4. (a) Design a Mod 12 asynchronous counter using J-K Flipflop. [10]
(b) Minimize the following four variable logic function using K-map [10]
 $f(A, B, C, D) = \sum m(0, 2, 3, 5, 6, 7, 8, 10, 11, 14, 15)$
and design using only NAND gates.

5. (a) Explain VHDL program format and write VHDL program for NAND gate. [10]
(b) Simplify following equation using Boolean algebra and Design using basic gates [10]
 $f(A, B, C) = A'B + BC' + BC + AB'C'$

6. Explain the following : [20]
 - (a) 3-bit binary to Gray code conversion.
 - (b) Working of Master slave J-K flip flop.
 - (c) Explain working Current Mirror Circuit.
 - (d) Explain working of Differential Amplifier.

