

(3 Hours)

[Total Marks: 80]

N.B.: (1) Question No. 1 is **compulsory**.

(2) Solve any **three** questions out of remaining **five**.

(3) Figures to **right** indicate **full** marks.

(4) Assume suitable **data** where **necessary**.

Q1. Solve any four

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- Prove that NOR gate is a universal gate.
- Convert following decimal number to Binary ,Octal, Hexadecimal and Gray code
(2538)₁₀
- Derive relation between α and β .
- Design full adder using half adder and additional gates.
- Covert D flip flop to T flip flop.

Q2. a) Explain Voltage Divider Biasing Circuit with its stability factor.

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b) Using Quine MC Cluskey Method determine Minimal SOP form for

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$$F(A,B,C,D) = \sum m(0,1,3,7,8,9,11,15)$$

Q3. a) Implement following using only one 8:1 Multiplexer and few gates.

$$F(A,B,C,D) = \sum m(0,1,3,4,5,7,9,10,12,15)$$

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b) With neat logic diagram explain operation of 4-bit Bidirectional Shift Register.

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Q4. a) Design a Mod 12 asynchronous counter using J-K Flipflop.

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b) Minimize the following four variable logic function using K-map

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$$i) \quad f(A,B,C,D) = \sum m(0,1,3,4,7,9,11,13,15)$$

$$ii) \quad f(A,B,C,D) = \pi M(0,2,5,6,10,12,13,14)$$

Q5. a) Simplify following equation using Boolean algebra and Design using basic gates

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$$i) \quad (A + B) (A + C)$$

$$ii) \quad (A + C) (AD + AD) + AC + C$$

b) Explain VHDL program format and write VHDL program for NAND gate.

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Q6 Solve any four-

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- 3-bit binary to Gray code conversion.
- Working of Master slave J-K flip flop.
- Explain working Current Mirror Circuit.
- Write VHDL program for Half Subtractor circuit.
- Explain working of 3:8 Decoder.