(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** 20

a) Prove that NAND and NOR gate are universal gate.
b) Convert following decimal number to Binary ,Octal, Hexadecimal and Gray code
i) $(256)_{10}$ ii) $(45)_{10}$
c) Draw and explain circuit diagram of a differentiator using Op-amp.
d) Covert S-R flip flop to D flip flop.
e) Derive the relation between α and β

Q2. a) Explain Voltage Divider Biasing Circuit with its stability factor. 10
b) Implement following using only one 8:1 Multiplexer and few gates.
$F(A,B,C,D)= \sum m(0,1,2,3,5,7,9,11,12,15)$ 10

Q3. a) Draw circuit diagram and explain the operation of Astable Multivibrator using IC555. 10
b) Design 4-bit binary to Excess-3 code conversion. 10

Q4. a) Minimize the following four variable logic function using K-map and design by using only NAND gates 10
$f(A,B,C,D)=\sum m (0,1,2,3,4,7,8,9,11,12,15)$
b) What are the different methods used to improve CMRR in Differential Amplifier. Explain one in brief. 10

Q5. a) Design a Mod 12 asynchronous counter using J-K-Flip Flop. 10
b) With the help of neat diagram explain functioning of Universal Shift register. 10

Q6 Write short notes on **any four** 20

a) Design XOR gate using only NOR gates.
b) Explain working of a Current Mirror Circuit.
c) Write VHDL program for half adder.
d) Explain Encode and Decoder.
e) Explain working of Zener diode with VI characteristics.

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