(Time: 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) Explain DC operating point and its variation with the help of output characteristics of transistor.
b) Convert S-R flip flop to J-K flip flop.
c) Design Ex-OR gate using NAND and NOR gates.
d) Design full substractor using half substractor and additional gates.
e) Convert following decimal number to Binary ,Octal, Hexadecimal and Gray code
i) $(345)_{10}$ ii)$(818)_{10}$

Q2. a) Explain collector to base bias Circuit with its stability factor. 10

b) Minimize the following four variable logic function using K-map and Design using only NAND gates. 10

$f(A,B,C,D)=\sum m\ (0,1,2,3,5,8,9,10,11,12,14)$

Q3. a) Design 4-bit binary to gray code conversion using basic gates. 10

b) i) Implement following using only one 8:1 Multiplexer and few gates.

$F(A,B,C,D)= \sum m(1,3,4,5,8,9,12,15)$

ii) With neat logic diagram explain in short operation of Universal Shift Register. 10

Q4. a) Design a Mod 10 synchronous counter using J-K Flipflop. 10

b) Using Quine MC Cluskey Method determine Minimal SOP form for 10

$F(A,B,C,D)= \sum m(0,1,2,5,6,7,8,9,10,14)$

Q5. a) Explain about ENTITY declarations in VHDL and write VHDL program for NAND and OR gates. 10

b) Implement 3 bit asynchronous u p counter and also sketch the timing diagram. 10

Q6 Solve the following- 20

a) Explain working of 8:1 Multiplexer.
b) Working of S-R flip flop(with its internal circuit diagram and truth table).
c) Explain working of Constant Current source.
d) Write VHDL program for full substractor.