Time: 3 HRS **Marks: 80**

Note: 1) Question No. 1 is compulsory.
2) Solve any three questions out of remaining five questions.
3) Assume suitable data if necessary.
4) Figures to the right indicate full marks.

1 Answer any **four.** **20**

a) Compare three modes of transistor operation based on biasing conditions of each junction and their application.
b) Perform $(89)_{10} - (26)_{10}$ using 2's complement method.
c) With neat circuit diagram and truth table explain 2:4 Decoder.
d) Draw circuit diagram of positive edge triggered T flip-flop and write its function table.
e) Design half adder using logic gates.

2 a) Explain working operation of current mirror circuit with its circuit diagram. **10**
b) Using K-map get the minimal SOP equation for the given function F and draw logic circuit for the minimized equation using different logic gates. **10**

$$F(A, B, C, D) = \Sigma\, m(0, 1, 3, 5, 7, 9, 10, 11, 12, 15).$$

3 a) Design a 3 bit binary synchronous up-counter using negative edge triggered D Flip-flop. **10**
b) Implement the following logic function using 8:1 MUX and few logic gates. **10**

$$F(A, B, C, D) = \Sigma\, m(0, 1, 2, 3, 7, 9, 10, 13, 15)$$

4 a) What is shift register? With neat diagram explain working operation of 3-bit Serial Input Parallel Output (SIPO) shift right register. **10**
b) Explain VHDL Program format and write VHDL program for full adder. **10**

5 a) Simplify the following equation using Boolean algebra and design simplified function using basic logic gates.

$$F(A, B, C) = AB + \overline{AC} + A\bar{B}C(AB + C)$$ **10**

b) Explain working of operation of ring counter with its circuit diagram. **10**

6 Answer any **four.** **20**

a) Explain differential amplifier with diagram
b) Working operation of negative edge triggered D flip-flop with circuit diagram.
c) Working of 4:1 Multiplexer with truth table and circuit diagram.
d) Covert hexadecimal number $(8E)_{16}$ to binary, octal, decimal and gray code.
e) Draw and explain one digit BCD adder.