

(Time: 3 Hours)

[Total Marks: 80]

- N.B. : (1) Question No. 1 is **Compulsory**.  
 (2) Attempt any **three** questions out of **remaining five**.  
 (3) Each question carries 20 marks and sub-question carry equal marks.  
 (4) Assume suitable data if required.

- Q1. a) Design and implement full subtractor using logic gates. (5)  
 b) Explain the working of a two –inputs CMOS NOR gate with a neat Diagram. (5)  
 c) Design a circuit using 2:1 MUX to implement 2 Input NAND Gate. (5)  
 d) Evaluate following operation in BCD. (5)  
 (i)  $(56)_{10} + (23)_{10}$  (ii)  $(48)_{10} + (26)_{10}$

- Q2.a) Convert  $(27)_{10}$  &  $(42)_{10}$  into binary, octal , Hexadecimal , Excess-3 code and Gray code. (10)

- b) Draw a neat circuit diagram of four bit Twisted ring counter with initial state 0000 and relevant output waveforms. (10)

- Q3.a) Design a combinational logic circuit with four input variables that will produce logic 1 output when input is greater than 9. (10)

- b) Draw a circuit diagram of clocked J-K flip –flop using NAND gates with truth table. What is race around condition and how does it get eliminated ? (10)

- Q4.a) Simplify the expression in POS form for given function and realize it with basic gates.  
 $F(A,B,C,D) = \sum m (0,4,6,7,10,12,14) + d (2,13)$  (10)

- b) Convert the followings (10)  
 i) SR flip flop to JK flip flop. ii) JK flip-flop to D flip-flop

- Q5 a) Implement the following expression using a single 8:1 multiplexer. (10)  
 $F(A,B,C,D) = \sum m (0,2,4,6,8,10,12,14)$

- b) Simplify the following four variable Boolean function using Quine-Mccluskey technique.  
 $F(A, B,C,D) = \sum m (0, 2, 3,6,7,8,10,12,13)$  (10)

- Q6.a) Design a Mod-5 synchronous up counter using T flip-flop. Design using minimal cost approach. (10)

- b) Explain interfacing of a TTL gate driving CMOS gates and vice versa. (10)