

- N.B.** (1) Question No. 1 is **compulsory**.
 (2) Solve any **four** from remaining **six** questions.

1. Answer the following questions (any **five**) :— 20
- Using Two's Complement Arithmetic Perform
 - 52-18
 - 36-64.
 - Convert decimal number 17 and 24 to their equivalent gray code
 - Design a circuit using full adder blocks to add two 4-bit numbers.
 - Prove that a dual of exclusive or is also its complement.
 - What are asynchronous preset and clear inputs of Flip-flop ? Explain their use.
 - Generate a 7 bit even parity hamming code for "1100".
 - Explain the Race around condition in JK flip-flop and methods to avoid it.
2. (a) Explain the following parameters of logic families :— 6
- Propagation delay
 - Fan out.
- (b) Explain interfacing of TTL and CMOS logic families. 6
- (c) Design a comparator using logic gates for comparing two 2 bit numbers. 8
3. (a) Implement using NAND gates only 6
- $$X = \sum m(0, 1, 3, 6, 8, 9, 12)$$
- (b) Implement the following function using Basic Gates (And Or Not) 8
- $$F = \prod M(0, 2, 5, 7, 8, 10, 12, 14)$$
- Simplify using K Map.
- (c) Explain BCD addition rules. 6
- Hence add
- $$(36)_{BCD} + (47)_{BCD}$$
4. (a) Design a three bit synchronous counter to give following sequence using D flip-flops. 10
- $$0 - 2 - 4 - 6 - 0$$
- Take care of Lockout condition while designing.
- (b) Write the expression for X in following circuit and hence write K Map for the same. 10
5. (a) Develop a state diagram for the sequence detector, which detects "1010" and outputs "1" on detection of the sequence. 8
- Write the state output table for the same sequence detector.
- (b) Explain what is half adder and how to implement full adder using half adders. 8
- (c) Using Boolean Algebra prove that 4
- $$AB + BC + \bar{A}C = AB + \bar{A}C$$
6. (a) Use Quine Mc Cluskey Technique to minimize following function — 12
- $$Y(A, B, C, D, E) = \sum m(0, 1, 3, 7, 8, 9, 11, 15, 22, 24, 27) + d(6, 16).$$
- (b) Design a MOD 6 asynchronous counter using JK flip-flops. 8

7. (a) Draw and explain a 4 bit universal shift register with following features :— 10
 (i) Right shift (ii) Left Shift (iii) Synchronous parallel load.
- (b) Analyze the circuit and hence draw state diagram. State whether it is a Mealy Machine 10
 or a Moore Machine.

