

PART B --- (5 × 16 = 80 marks)

11. (a) (i) Convert $(110A\text{-}AB)_{16}$ to decimal, binary and octal. (6)
- (ii) Obtain the minimum SOP and POS for the function given below using Karnaugh map reduction technique :

$$F = \sum m(1, 3, 4, 5, 6, 7, 9, 12, 13) \quad (10)$$

Or

- (b) (i) Perform $(51)_{10} - (37)_{10}$ using 1's complement and 2's complement arithmetic. (4)
- (ii) Perform the following decimal addition $(589)_{10} + (199)_{10}$ in BCD. (4)
- (iii) Encode the binary word $(1011)_2$ into seven bit even parity Hamming code. (4)
- (iv) Show that excess-3 code is a self complementing code. (4)
12. (a) (i) Implement the function $F = AB + \overline{CD}$ using NAND gates only. (4)
- (ii) Implement a two input AND gate using NOR gates only. (4)
- (iii) Draw a CMOS two input NOR gate and NAND gate. (4)
- (iv) Write down the truth table of a half subtractor and draw its logic circuit. (4)

Or

- (b) (i) Design a two bit magnitude comparator. (10)
- (ii) Implement the function

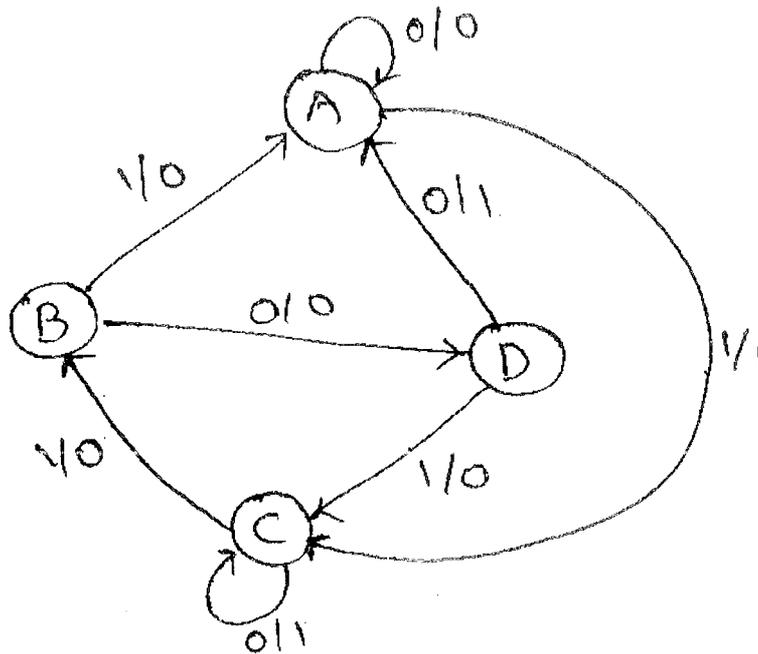
$$F(A, B, C, D) = \sum m(0, 1, 3, 5, 8, 9, 15)$$

using a 8 : 1 Multiplexer. (6)

13. (a) (i) Convert a T-flip flop to a D flip flop. (6)
- (ii) Design a MOD-5 synchronous counter using JK flip flops. (10)

Or

- (b) (i) A state diagram of a sequential circuit is given below. The circuit has one input and one output. Design sequential circuit using T flipflops. (8)



- (ii) Differentiate between Moore Machine and Mealy Machine. (4)
 (iii) Draw the circuit for a D Latch using NAND gates only. (4)

14. (a) (i) An asynchronous sequential circuit is described by following excitation and output function :

$$Y = X_1 X_2 + (X_1 + X_2)_Y \text{ (excitation)}$$

$$Z = Y \text{ (output)}$$

Draw a logic diagram of the circuit. Derive the transition table and output map. Describe the behaviour of the circuit. (8)

- (ii) Write short notes on shared row state assignment and one hot state assignment. (8)

Or

- (b) (i) Explain in detail static, dynamic and essential hazards in a digital circuit. (10)

- (ii) Give the hazard free realisation for the Boolean equation

$$F(A, B, C, D) = \sum m(1, 3, 6, 7, 13, 15) \quad (6)$$

15. (a) Explain in detail the various classifications of memories. (16)

Or

(b) (i) Write detailed notes on Field Programmable Gate Arrays (FFGA).(8)

(ii) Draw a circuit for MOS based static RAM cell and explain its operation. (8)