

1) Using Q-M method, obtain all the prime implicants for each of the Boolean expressions.

$$a) f(w, x, y, z) =$$

$$\sum m(7, 9, 12, 13, 14, 15) \\ + dc(4, 11)$$

$$b) f(w, x, y, z) = \sum m(0, 2, 6, 8, 10) \\ + dc(1, 4, 7, 11, 13, 14)$$

2) Design a 3:8 Decoder using NAND gates.

3) Design a 16:1 multiplexer using 4:1 multiplexers

4) Design a master-slave JK Flip-flop

5) Design a universal Shift register for 4-bits.