1.  Use Karnaugh map to simplify the Boolean function $F(A, B, C, D) = \Sigma m (0, 1, 4, 5, 12, 13)$ in sum-of-products form. (10%)

2.  Determine the prime implicants and essential prime implicants of the following Boolean function: $F(A, B, C, D) = \Sigma m (0, 1, 4, 5, 12, 13)$ . (10%)

3.  Convert the function $wx'y' + yw'z' + yxz + yxw$ into 3-input NAND gates. (15%)

4.  Design a 4-bit carry-look-ahead (CLA) generator. (15%)

5.  Using two 4:1 multiplexers to implement a full-adder. (15%)

6.  Show how to implement a D flip-flop starting with a J-K flip-flop. (15%)

7.  Design a three flip-flop counter that counts in the following sequence: 0, 2, 7, 4, 6, 3, 1, and repeat. (20%)