1. (**10 marks**) Reduce the following Boolean expressions with minimum number of literals:
   1. +w
2. (**15 marks**) Write the following Boolean expression in sum of products form and simplify it afterwards using Karnaugh-Map.
3. (**15 marks**) Construct a 16×1 multiplexer using two 8×1 and one 2×1 multiplexers.
4. (**15 marks**) Implement the Boolean function using
   1. A 2×1 multiplexer
   2. A decoder
5. (**45 marks**) A sequential circuit has two JK flip-flops A and B, two inputs x and y, and one output of z. The flip-flop input equations and circuit output equation are:

1. Draw the sequential circuits
2. Derive the simplified state equations for A and B
3. Tabulate the state table
4. Draw the state diagram of the circuit
5. Re-draw the sequential circuit using a D-Flip-Flop