Homework 6: EE 252 Digital Electronics

1. Show how the function $f(w_1, w_2, w_3) = \sum m(1, 2, 3, 5, 6)$ can be implemented using a 3-to-8 binary decoder and an OR gate.

2. Consider the function

$$f = \overline{w}_1\overline{w}_3 + w_2\overline{w}_3 + \overline{w}_1 w_2.$$

   Use the truth table to derive a circuit for f that uses a 2-to-1 multiplexer.

3. For the function $f(w_1, w_2, w_3) = m(0, 2, 3, 6)$, use Shannon's expansion to derive an implementation using a 2-to-1 multiplexer and any other necessary gates.

4. Consider the multiplexer-based circuit illustrated in Figure P4.1. Show how the function

$$f = w_2\overline{w}_3 + w_1 w_3 + \overline{w}_2 w_3$$
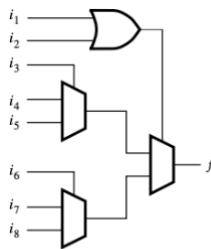
can be implemented using only one instance of this circuit.

Figure P4.1   A multiplexer-based circuit.