1. Design a 1-bit full adder (with carry in and carry out) using two 4x1 multiplexers.

2. Use the types of decoders specified below with minimum number of other gates to implement a function which gives the following output:
   - 1, if the binary representation of any number less than 16 contains odd number of 1’s
   - 0, otherwise.
   a. Using 3:8 decoders
   b. Using 2:4 decoders

3. Implement the following function using the template of 2:1 Multiplexers given. Determine X1, X2, X3 and X4. NOTE: They are either one of the literals, 1 or 0.
   \[ F(A, B, C, D) = \sum(4, 5, 6, 7, 11, 13) + DC(8, 15) \]

4. Consider an 8-bit comparator with outputs for “P=Q” and “P>Q”.

\[ X1 \quad I0 \quad X3 \quad I0 \quad X4 \quad I0 \quad So \quad F \]

\[ X2 \quad I1 \quad \quad I1 \quad D \quad \quad A \]

\[ B \quad \quad \quad \quad \quad \quad \quad \quad \quad \quad A \]
Design a 16-bit comparator with outputs “P=Q”, “P>Q”, and “P<Q”, using two copies of the above 8-bit comparator, NOR gates, and INVERTERS.