**Problem 1:** (10 points) (a) Find the decimal for the four-bit two’s complement number 1101
(b) Convert \( \frac{202}{3} \) to decimal

**Problem 2:** (10 points) (a) Design a circuit that implements the following function using AND, OR and NOT gates.
\[ f = A(BC + \bar{B}D) + B(CD + E) \]
(b) Use a 4-to-1 MUX to design the same circuit.

**Problem 3:** (10 points) Consider a function \( F(A, B, C, D) \) that takes the value 1 if and only if the number of 1’s in \( B \) and \( C \) is greater than or equal to those in \( A \) and \( D \).
(a) Write the truth table for the function.
(b) Use an 8-to-1 multiplexer to implement \( F \).

**Problem 4:** (10 points) Design a FSM that outputs a 1 when the last three inputs are 100 or 001. Show the FSM and the state table. Design and show the circuit that implements the design.