

Assignment 03

Total: 30

Deadline: 20 April, 2025

This assignment must be hand-written. Show ALL steps in ALL questions.

Make sure that your circuit is efficient, meaning you should use the lowest number of components. You may use external gates if required.

Question 1 (5 Marks)

Build a circuit that implements the 1's complement number system (3 bits) using encoder(s) and decoder(s).

Question 2: (5 Marks)

Implement the following boolean function using **a)** single 16:1 mux **b)** single 8:1 mux
 $F(A,B,C,D) = \sum(0,1,2,7,8,10,11,13, 15)$. Use external gates if required.

Question 3: (5 Marks)

Implement the following boolean function using **a)** 4x16 decoder(s) only **b)** 2x4 decoder(s) only
 $F(A,B,C,D,E) = \sum(0,1,2,7,8,10,11,13, 15,18,21,24,25)$. Use external gates if required.

Question 4: (5 Marks)

Implement the following function using **exactly five 3x8 decoders**. Unused input connection(s) should be connected to ground. Mention MSB and LSB accurately.
 $F(A,B,C,D,E) = \sum(0,2,5,8,11,15,18,19,23,26,29)$

Question 5: (5 Marks)

Consider A is a 4 bit number. Design A-3 (A minus 3) using a 4 bit parallel adder. Use external gates if required.

Question 6 (5 Marks)

Design a BCD to Excess-6 code converter using parallel adder.