National University

of Computer and Emerging Sciences Chiniot -Faisalabad Campus

EE1005 – Digital Logic Design
Quiz# 5

Instructor: Muhammad Adeel Tahir **Section:** SE-A **Time:** 60 Minutes

Name: _____

Roll No: _____ **Total: 20+15+30=65 marks**

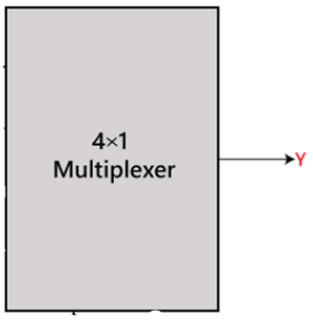
Instructions: *Make sure the handwriting is neat and clean while drawing the circuit, quiz will be marked as 0 if attempted in a writing that is not readable at all.*

PART (a)

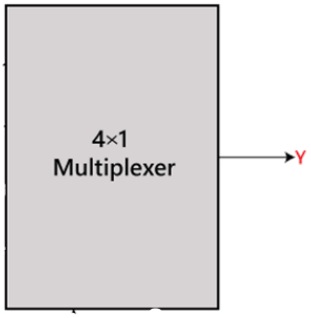
Question 1: Design a circuit that takes a 3-bit binary input and outputs a 2-bit binary number representing the count of '1's in the input. Use a 3-to-8 decoder, OR gates, and a 4-to-2 encoder for implementation. **[5 marks]**

Question 2: Implement the following Boolean function with 4X1 MUX and external gates where AB are select lines and C D are data lines. **[10+10 marks =20 marks]**

a) $F(A,B,C,D) = \sum(1,3,4,11,12,13,14,15)$



b) $F\ (A, B, C, D)\ = \sum (1,2,5,7,8,10,11,13,15)$

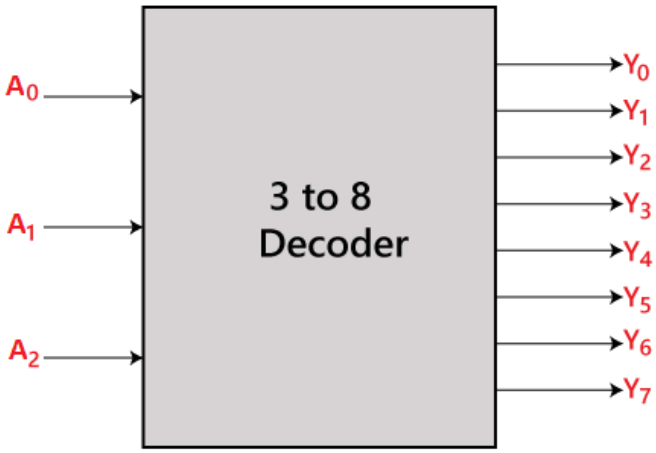


Part (b)

Question 3: Design a combinational circuit with a decoder to accept a 3-bit number and generate the output binary number equal to the square of the input number. Implement this using 8:4 decoder. **[15 marks]**

Working (if any):

(No cutting allowed)



PART (c)

Question 4: A sequential circuit with two D flip-flops A and B, two inputs, x and y ; and one output z is specified by the following next-state and output equations. **[15 Marks]**

$$A(t+1) = xy' + xB$$
$$B(t+1) = xA + xB'$$
$$z = A$$

Implement the following:

a) Draw the logic diagram of the circuit. **5 marks**
b) List the state table for the sequential circuit. **6 marks**
c) Draw the corresponding state diagram. **4 marks**

Logic Diagram of the circuit (diagram must be neat and clean with proper connections, a 0 will be awarded in case the connections are not labelled and drawn properly)

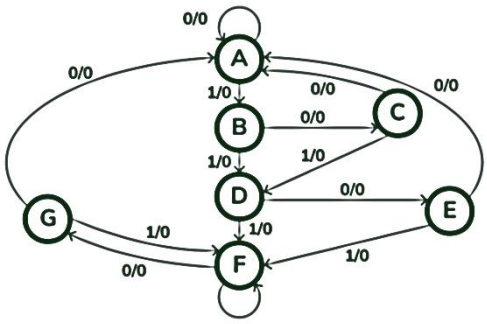
State Diagram (No cutting allowed)

Question 5: Given the following state diagram, perform the following tasks: **[5+5+5=15 marks]**

a) Construct the state table that corresponds to the given state diagram.

b) Reduce the state table to its minimized form <u>step by step</u>.

c) Draw the reduced state diagram



a)

State Table (binary checking- no cutting allowed)				

Intentionally Left blank for working area

Bonus Question: **(2 marks)**

1. In a car race, Alex finishes before Ben and Carl, but behind Dave. Ben finishes before Carl but behind Emma. Who finishes the race first? _____