National University of Computer and Emerging Sciences 0128

Islamabad Campus

Digital Logic Design - Lab (EL1005)

Course Instructor(s):
Mr. Talha Tariq & Sidra Fayyaz
Section: DS-AI

Sessional-I Exam

Total Time (Hrs): 1
Total Marks: 35
Total Questions: 3

Date: March 24, 2025

Roll No **Course Section** **Student Signature**

Do not write below this line.

Attempt all the questions.

DO NOT OPEN THE QUESTION BOOK OR START UNTIL INSTRUCTED.

Instructions:

Attempt all of them. Read the question carefully, understand the question, and then attempt it.

Plagiarism is strictly prohibited.

Plagiarism=0 marks or may be F Grade.

After asked to commence the exam, please verify that you have 3 different printed pages including this title page. There are total of 3 questions.

Submit the proteus file on the classroom. Don't zip the file.

CLO	2	3	2	
Questions	Q-1	Q-2	Q-3	Total
Marks Obtained	14	7	02	23
Total Marks	20	10	5	35

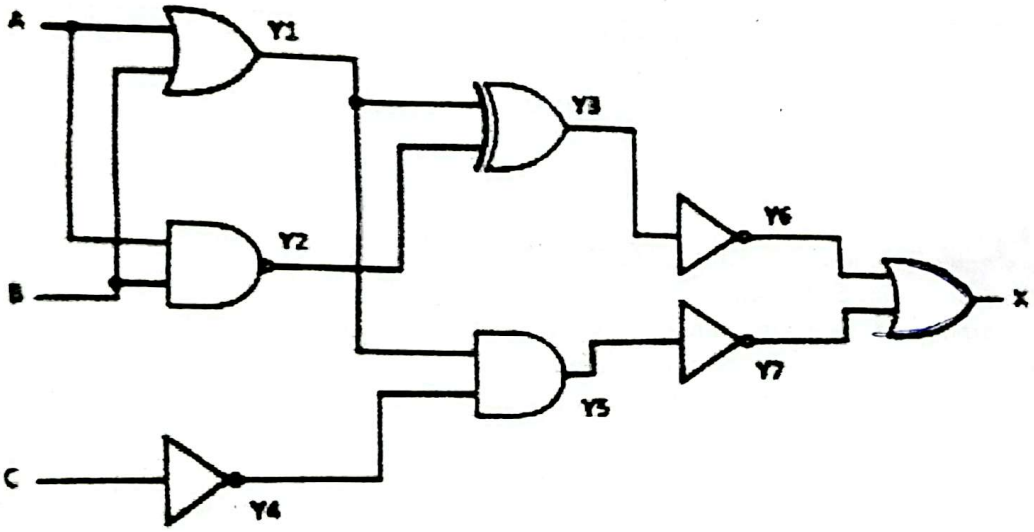
[CLO 2:]

Q1(a) Consider the following Boolean function: **[10 marks]**

$$F(W,X,Y,Z) = \Pi M(0,6,8,13,14) + d(2,4,10)$$

i. Simplify the given function using a **K-Map**. **[7 marks]**
ii. Draw the **simplified circuit diagram** in **Proteus**. **[3 marks]**

Q1(b) Consider the given diagram. **[10 marks]**



i. Write the Boolean equations for **Y1 to X** based on the given logic circuit. **[4 marks]**
ii. Simplify the final Boolean equation for **X** using **Boolean algebra rules**. **[6 marks]**

[CLO 3:]

Q2: Scenario: **[10 marks]**

A global competition organizer must determine if a participant qualifies for the final round based on multiple eligibility criteria. The competition has strict rules regarding qualification, nationality, document verification, sponsorship, and official invitations.

To ensure fairness, the system automatically processes applications based on a set of predefined rules. If a participant meets all the eligibility conditions, they will proceed to the final round. If key conditions are not met, they will be disqualified. In some cases, conditional approval may be given if only the sponsorship requirement is missing.

A participant's status in the competition is determined based on the following conditions:

- A participant **qualifies for the final round** if they have **passed the qualification round(Q)** , **meet the nationality requirement(N)**, **have verified documents (V)**, **secured sponsorship (S)**, and **received an international invitation(I)**.
- A participant is **disqualified** if they fail **any** of the key conditions: not passing the qualification round , not meeting nationality requirements, not having verified document, or not receiving an international invitation.
- A participant receives **Conditional Approval** if they meet **all requirements except sponsorship.** They do not qualify immediately but may proceed if sponsorship is later secured.

estions:

i. Identify the input and output variables for the given scenario. **[4 marks]**
ii. Construct a truth table representing all possible combinations of input variables and their corresponding output values. **[6 marks]**

O 2:]

: Complement **[5 marks]**

iculate the 2's complement of the given binary value and design the corresponding circuit in oteus: 110110