National University of Computer and Emerging Sciences, Lahore Campus				
	Course:	**Discrete Structures**	**Course Code:**	**CS-1005**
	Program:	**Computer Sciences**	**Semester:**	**Fall 22**
	Date of Assignment	**September 15, 2022**	**Total Marks:**	**50**
	Due of submission	**September 22, 2022**	**Roll No:**	
	Section:	**All**	**Page(s):**	**2**
	Evaluation	**Assignment-1**		
Instruction/Notes:	Solve assignment on A4 page and submit on due date			

1) Determine whether the statements are logically equivalent. In each case, construct a truth table and include a sentence justifying your answer. Your sentence should show that you understand the meaning of logical equivalence.

i. $p \wedge (q \vee r)$ and $(p \wedge q) \vee (p \wedge r)$

ii. $(p \vee q) \vee (p \wedge r)$ and $(p \vee q) \wedge r$

2) Prove that the statement is tautology or contradiction.

i. $(p \wedge q) \vee (\sim p \vee (p \wedge \sim q)$

3) The famous detective mystery. He determined the following facts:

a. Lord Hazelton, the murdered man, was killed by a blow on the head with a brass candlestick.

b. Either Lady Hazelton or a maid, Sara, was in the dining room at the time of the murder.

c. If the cook was in the kitchen at the time of the murder, then the butler killed Lord Hazelton with a fatal dose of strychnine.

d. If Lady Hazelton was in the dining room at the time of the murder, then the chauffeur killed Lord Hazelton.

e. If the cook was not in the kitchen at the time of the murder, then Sara was not in the dining room when the murder was committed.

f. If Sara was in the dining room at the time the murder was committed, then the wine steward killed Lord Hazelton.

Is it possible for the detective to deduce the identity of the murderer from these facts? If so, who did murder Lord Hazelton? (Assume there was only one cause of death.) Percule Hoirot was called in to solve a baffling murder

4) An alarm system has three different control panels in three different locations. To enable the system, switches in at least two of the panels must be in the on position. If fewer than two are in the on position, the system is disabled. Design a circuit to control the switches and input output table.

5) A committee of three individuals decides issues from an organization. Each individual votes either yes or no for each proposal that arises. A proposal is passed if it receives at least two yes votes. Make Boolean expression, simplify and design a circuit that determines whether a proposal passes.