National University of Computer and Emerging Sciences, Lahore Campus			
Course:	**Discrete Structures**	**Course Code:**	**CS1005**
Program:	**BS- Software Engineering**	**Semester:**	
Section:	**2B**	**Total Marks:**	**30**
Submission deadline:	**22-2-2023**	**Weight**	3.3
Assignment:1		**Page(s):**	2

Instruction/Notes:	1. Understanding of the problems is part of the assignments. So no query please. 2. You will get Zero marks if found any type of cheating. 3. 25 % deduction of over marks on the one day late submission after due date 4. 50 % deduction of over marks on the two day late submission after due date 5. No submission after two days. 6. MUST BE HAND WRITTEN.

Question 1 : Which of these are propositions? What are the truth value of those that are proposition?

(1 Mark for each)

a) 2+3 = 5
b) 4 + x = 5
c) There is no pollution in Pakistan.
d) The moon is made of green cheese.
e) $2^n \geq 100$
f) Answer this question.

Question 2 : Write **Inverse, Converse** and **Contrapositive, also apply implication law** on the following statements: **(1 Mark for each)**

a) If it snows today. I will ski tomorrow.
b) I come to class whenever there is going to be a quiz.
c) I go to the beach whenever it is a sunny summer day.
d) When I stay late, it is necessary that I sleep until noon.

Question 3 : Let *p* and *q* be the propositions. **(1 Mark for each)**

p: "I bought a lottery ticket."
q: "I won the million dollar jackpot on Friday."

Express each of these propositions as an English sentence.

a) p b) $p \rightarrow q$
c) $p \leftrightarrow q$ d) $p \vee (p \wedge q)$

Question 4: Let *p*, *q*, be the propositions **(1 Mark for each)**

p :You drive over 65 miles per hour.
q :You get a speeding ticket.

Write these propositions using *p* and *q* and logical connectives.

a) You will get a speeding ticket if you drive over 65 miles per hour.

b) If you do not drive over 65 miles per hour, then you will not get a speeding ticket.

c) you get a speeding ticket, but you do not drive over 65 miles per hour.

d) Driving over 65 miles per hour is sufficient for getting a speeding ticket.

Question 5: By using the rules of logical equivalences, show the propositions are logically equivalent: (2 Marks for each)

a) $(s \rightarrow r) \wedge (q \rightarrow r)$ and $(s \vee q) \rightarrow r$
b) $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$ is Tautology
c) $[(p \vee q) \wedge (\sim p \vee r)] \rightarrow (q \vee r)$ is Tautology.
d) Determine whether $(p \rightarrow (q \rightarrow r)) \rightarrow ((p \wedge q) \rightarrow r)$ is Tautology.

Question 6: What is the logical translation of the following statement? **(1 Marks for each)**

"None of my friends are perfect."

(A) $\exists x(F(x) \wedge \neg P(x))$
(B) $\exists x(\neg F(x) \wedge P(x))$
(C) $\exists x(\neg F(x) \wedge \neg P(x))$
(D) $\neg \exists x(F(x) \wedge P(x))$