



FALL-2024 CS-Department Assignment 1

Issue Date: 14-11-2024

Due date: 24-11-2024

Total Marks 50

Course Code: CS101	Course Name: Discrete Structures
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Instructions:

You must submit the **scanned copy** of your own handwritten assignment on google classroom within the due date, strong action would be taken on plagiarism cases from straight **ZERO** in assignment to **Grade F** in course.

1. Suppose the following two propositions are both False.

[10 points]

- If the student has passed Calculus, then he is registered for Discrete Math.
- The student has not passed Programming.

Determine the truth value of the following propositions. Just list the truth value.

- (a) The student has passed Programming and he is registered for Discrete Math.
- (b) The student has passed Calculus and he has passed Programming.
- (c) The student is not registered for Discrete Math or he has passed Programming.
- (d) If the student is not registered for Disc. Math, then the student has not passed Calc..
- (e) If the student is registered for Discrete Math, then he has passed Programming.
- (f) If the student has not passed Calculus, then he is not registered for Discrete Math.
- (g) If the student is registered for Discrete Math, then he has passed Calculus.
- (h) The student has passed Programming if and only if he has passed Calculus.
- (i) The student has passed Programming or he has passed Calculus but not both
- (j) The student has passed Programming or he has passed Calculus or he is registered for Discrete Math.

2. Show the following equivalences using using logical equivalence laws.

[10 points]

- (a) Show that $(P \rightarrow R) \vee (Q \rightarrow R) \equiv (P \wedge Q) \rightarrow R$
- (b) Show that $P \wedge (Q \vee R) \equiv (P \wedge Q) \vee (P \wedge R)$.
- (c) Show that $\neg[\neg[(P \vee Q) \wedge R] \vee \neg Q] \equiv Q \wedge R$
- (d) Show that $(P \vee Q \vee R) \wedge (P \vee T \vee \neg Q) \wedge (P \vee \neg T \vee R) \equiv P \vee [R \wedge (T \vee \neg Q)]$

3. Let A, B and C be propositions. Using truth table show that the following is a logical equivalence.

[10 points]

$$(\neg A \vee B) \wedge (\neg B \vee C) \wedge (\neg C \vee A) \wedge (\neg A \vee \neg B \vee \neg C) \equiv (\neg A \wedge \neg B \wedge \neg C).$$

[illegible]

4. Use Truth tables to see if the following statements are true:

[10 points]

$$(a) P \rightarrow (Q \wedge R) \equiv (Q \rightarrow P) \wedge (P \rightarrow R)$$

$$(b) (P \vee Q) \rightarrow R \equiv [(P \rightarrow R) \wedge (Q \rightarrow R)]$$

(c) $[P \rightarrow (Q \vee R)] \equiv [\neg R \rightarrow (P \rightarrow Q)]$

(d) $(P \wedge Q) \rightarrow R \equiv (\neg R \vee P) \rightarrow Q$

5. Complete the following truth table:

[10 points]

[illegible]