

ASSIGNMENT # 1

Read Carefully:

- Assignment **1** has **4** questions that you have to answer and submit in **HANDWRITTEN** form.
- The deadline for this assignment is on or before **30-Sept-2019**
- **WARNING:** This is individual assignment; you must solve it by yourself. Any form of plagiarism will result in receiving ZERO in the assignment.
- **WARNING:** Late submission will not be accepted. Any assignment submitted after the cut-off time will receive ZERO.
- **WARNING:** Do not alter the sequence of questions and *illegitimate handwriting* is not acceptable.

Problem#1 [2 points]

Translate the following sentences from English to predicate logic. The domain for this problem is X, "*the set of people*". You may use the propositional functions S(x), meaning that "*x has been a student of CS211*" A(x), meaning that "*x has gotten an 'A' in CS211*" T(x), meaning that "*x is a TA of CS211,*" and E(x,y), meaning that "*x and y are the same person.*"

- (a) There are people who have taken CS211 and have gotten A's in CS211.
- (b) All people who are CS211 TA's and have taken CS211 got A's in CS211.
- (c) There are no people who are CS211 TA's who did not get A's in CS211.
- (d) There are at least three people who are TA's in CS211 and have not taken CS211.

Problem#2 [2.5 points]

Use both *logical equivalences* and *truth table* to prove or disprove the following statements. Also write C++ programs to generate truth table for any *two* of the following.

- (a) $\neg (P \vee (Q \wedge R)) \equiv (\neg P) \wedge (\neg Q \vee \neg R)$
- (b) $\neg (P \wedge (Q \vee R)) \equiv \neg P \vee (\neg Q \vee \neg R)$
- (c) $\neg (P \vee \neg (P \wedge Q))$ is a Contradiction.
- (d) $(P \rightarrow R) \vee (Q \rightarrow R) \equiv (P \wedge Q) \rightarrow R$
- (e) $(\neg S \wedge F) \wedge (\neg B \rightarrow \neg F) \wedge (F \wedge (\neg B \vee \neg S)) \equiv F$

Problem#3 [1.5 points]

Which rule of inference is used in each argument below?

- Alice is a Math major. Therefore, Alice is either a Math major or a CSI major.
- Jerry is a Math major and a CSI major. Therefore, Jerry is a Math major.
- If it is rainy, then the pool will be closed. It is rainy. Therefore, the pool is closed.
- If it snows today, the university will close. The university is not closed today. Therefore, it did not snow today.
- If I go swimming, then I will stay in the sun too long. If I stay in the sun too long, then I will sun burn. Therefore, if I go swimming, then will sun burn.
- I go swimming or eat an ice cream. I did not go swimming. Therefore, I eat an ice cream.

Problem#4 [1.5]

Using the given premise prove the following conclusions.

(a)

Premises:

$$\begin{cases} \sim A \rightarrow (C \wedge D) \\ A \rightarrow B \\ \sim B \end{cases}$$

Prove: C.

(c)

Premises:

$$\begin{cases} \sim (A \vee B) \rightarrow C \\ \sim A \\ \sim C \end{cases}$$

Prove: B.

(b)

Premises:

$$\begin{cases} P \wedge Q \\ P \rightarrow \sim (Q \wedge R) \\ S \rightarrow R \end{cases}$$

Prove: $\sim S$