CSE 015: Discrete Mathematics
Fall 2020
Homework #1
Solution

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Lab CSE-015-10L

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1. **Question 1:**

   (a) It is not the case that XYZ scored 100 percent in the CSE015 final.

   (b) It is not the case that XYZ scored at least 90 percent in the labs.

   (c) If XYZ scored 100 percent in the CSE015 final or XYZ scored at least 90 percent in the labs, then XYZ receives an A+ in CSE015.

   (d) If XYZ scored 100 percent in the CSE015 final and XYZ scored at least 90 percent in the labs, then XYZ receives an A+ in CSE015.

   (e) It is not the case that if XYZ is a CSE major, then XYZ receives an A+ in CSE015.

2. **Question 2:**

   (a)

p	q	r	$q \vee \neg r$	$p \oplus (q \vee \neg r)$
F	F	F	F	T
F	F	T	T	T
F	T	F	T	T
F	T	T	T	T
T	F	F	T	F
T	F	T	F	T
T	T	F	T	F
T	T	T	T	F

   (b)

p	q	r	$p \vee q$	$\neg r \vee p$	$(p \vee q) \rightarrow (\neg r \vee p)$
F	F	F	F	T	T
F	F	T	F	F	T
F	T	F	T	T	T
F	T	T	T	F	F
T	F	F	T	T	T
T	F	T	T	T	T
T	T	F	T	T	T
T	T	T	T	T	T

(c)

p	q	$p \to q$	$(p \to q) \wedge p$	$((p \to q) \wedge p$
F	F	T	F	T
F	T	T	F	T
T	F	F	F	T
T	T	T	T	T

3. **Question 3 :**

(a)

p	q	r	$q \vee r$	$p \vee (q \wedge r)$	$p \vee q$	$p \vee r$	$(p \vee q) \wedge (p \vee r)$	$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$
F	F	F	F	F	F	F	F	F = F
F	F	T	F	F	F	T	F	F = F
F	T	F	F	F	T	F	F	F = F
F	T	T	T	T	T	T	T	T = T
T	F	F	F	T	T	T	T	T = T
T	F	T	F	T	T	T	T	T = T
T	T	F	F	T	T	T	T	T = T
T	T	T	T	T	T	T	T	T = T

(b)

p	q	r	$p \to q$	$p \to r$	$(p \to q) \wedge (p \to r)$	$q \vee r$	$p \to (q \vee r)$	$(p \to q) \wedge (p \to r) \equiv p \to (q \wedge r)$
F	F	F	T	T	T	F	T	T = T
F	F	T	T	T	T	T	T	T = T
F	T	F	T	T	T	T	T	T = T
F	T	T	T	T	T	T	T	T = T
T	F	F	F	F	F	F	F	F = F
T	F	T	F	T	F	T	T	F $\neq T$
T	T	F	T	F	F	T	T	F $\neq T$
T	T	T	T	T	T	T	T	T = T

4. **Question 4 :**

(a)

p	q	$p \vee q$	$p \to (p \vee q)$
F	F	F	T
F	T	T	T
T	F	T	T
T	T	T	T

i. Tautology

(b)

p	q	$p \wedge q$	$(p \wedge q) \to \neg p$
F	F	F	T
F	T	F	T
T	F	F	T
T	T	T	F

i. Contingency

(c)

p	q	r	$q \vee r$	$p \to (q \vee r)$	$\neg q$	$\neg q \vee p$	$p \to (q \vee r) \to (\neg q \vee p)$
F	F	F	F	T	T	T	T
F	F	T	T	T	T	T	T
F	T	F	T	T	F	F	F
F	T	T	T	T	F	F	F
T	F	F	F	F	T	T	T
T	F	T	T	T	T	T	T
T	T	F	T	T	F	T	T
T	T	T	T	T	F	T	T

i. Contingency

5. **Question 5 :**

(a) $\neg(\neg p \vee \neg q) \equiv (p \vee q)$

i. It is not the case that you cannot be late and you cannot smoke.

(b) $\neg(p \wedge q) \equiv (\neg p \vee \neg q)$

i. It is not the case that you can take an annuity and it is not the case that you can take a lump sum.