Philadelphia University Faculty of Engineering Department of Computer Engineering		Date:- 03/04/2018 Allowed time:- 60 minutes

Discrete Mathematics (630260) First Exam

Student Name: - ……..... ID: - ……

Question 1:- Construct a truth table for each of the following compound proposition. 10 points

1- $\neg p \rightarrow (q \rightarrow r)$

2- $(p \vee \neg t) \wedge (p \vee \neg s)$

Question 2:- Show that each of the following proposition is a tautology (don't use truth table use rules of equivalence). 10 points

1- $[\neg p \wedge (p \vee q)] \rightarrow q$

2- $\neg(p \rightarrow \neg q) \rightarrow q$

Question 3: Show that the following pairs of propositions are equivalent. 10 points

1- $(p \rightarrow q) \wedge (p \rightarrow r)$ **and** $p \rightarrow (q \wedge r)$

2- $\neg p \rightarrow (q \rightarrow r)$ **and** $q \rightarrow (p \vee r)$

Question 4: Let Q(x) be the statement "x + 1 > 2x." what are these truth values of the following Quantifiers with respect to given domain? 24 points

	Z (integers)	Z^+ (positive integers)	Z^- (negative integers)
$\exists x\, Q(x)$			
$\forall x\, Q(x)$			
$\exists x \neg Q(x)$			
$\forall x \neg Q(x)$			

Question 5: For each of these arguments determine whether the argument is correct or incorrect and explain why.

8 points

1- **All students in this class understand logic. sami is a student in this class. Therefore, sami understands logic.**

2- **Every computer Engineering major takes discrete mathematics. Hani is taking discrete mathematics. Therefore, Hani is a computer Engineering major.**

Question 6:- Prove that if $(7n + 4)$ is even then n is even (use contraposition principle). 6 points

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Question 7:- Let A={ 1 , 2 , 3 } and B={ a , b } and C={ 0 , 1} find C × A × B . **8 points**

Question 8:- Let Ai = { -∞ , … , -i-2 , -i - 1 , -i , i , i + 1 , i + 2 , … , ∞ } find. **8 points**

1- $\bigcap_{i=0}^{n} Ai$
2- $\bigcup_{i=0}^{n} Ai$

Question 9: Determine whether each of these functions is a one-to-one correspondence (bijection) from R to R. **6 points**

1- $f(x) = 3x^2 + 6$

2- $f(x) = 2x + 1$

Question 10: find the solution of the following recurrences **10 points**

1- $a_n = (n+1)a_{n-1} \qquad a_0 = 2$

2- $a_n = -2a_{n-1} \qquad a_0 = 1$
