


Philadelphia University Faculty of Engineering Department of Computer Engineering		First Semester 2015/2016 Date:- 02/02/2016 Allowed time:- 2 Hours
Discrete Mathematics (630260) Final Exam		
Student Name: - ID: -		

Question 1:-Show that the following two statements are logically equivalent 2 points
 $(p \rightarrow q) \wedge (p \rightarrow r) \equiv p \rightarrow (q \wedge r)$

Question 2:- Use rules of inference to show that if 4 points
 $\forall x(P(x) \vee Q(x))$ and
 $\forall x(\neg Q(x) \vee S(x))$ and
 $\forall x(R(x) \rightarrow \neg S(x))$ and
 $\exists x \neg P(x)$
then
 $\exists x \neg R(x)$

Question 3:- Let $A_i = \{ \dots, -2, -1, 0, 1, \dots, i \}$. Find 2 points
a) $\bigcup_{i=1}^n A_i$ b) $\bigcap_{i=1}^n A_i$

Question 4:- Let A is a zero-one matrix where 3 points
 $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$.
Find
a) A^2 b) A^3 c) $A \vee A^2 \vee A^3$

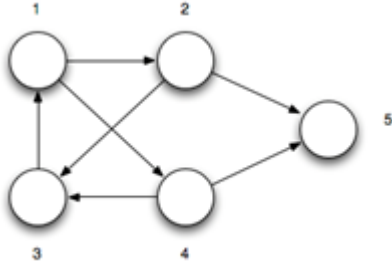
Question 5:- Prove that if a and b are positive integers, then $ab = \gcd(a, b) \cdot \text{lcm}(a, b)$. 3 points

Question 6:- Solve each of these congruences 6 points
a) $5x \equiv 43 \pmod{53}$
b) $17x \equiv 10 \pmod{11}$

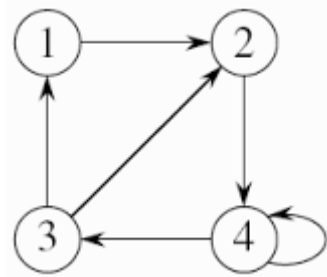
Question 7:- Use mathematical induction to prove the followings: 2 points
 $1.1! + 2.2! + 3.3! + \dots + n.n! = (n + 1)! - 1$ whenever n is a positive integer.

Question 8:- given the following relation R on set $A = \{a, b, c, d\}$
 $R = \{(b, c), (b, a), (c, d), (d, a), (a, b), (d, c)\}$ answer the following questions. 2 points
a) Represent the relation using directed graph 1 point
b) Represent the relation using Zero-One matrix 1 point
c) Determine whether the relation R is Equivalence, Partial ordering or not. 2 points

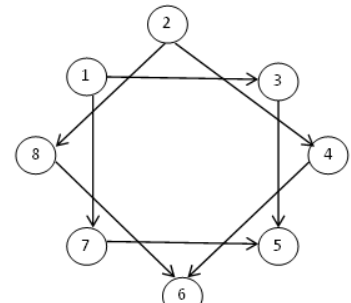
Question 9:- Determine whether each of these graphs is strongly connected and if not, whether it is weakly connected. 3 points



G1

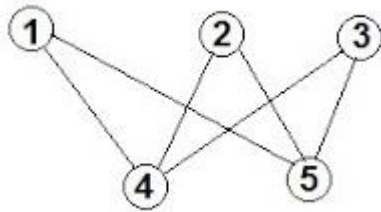


G2

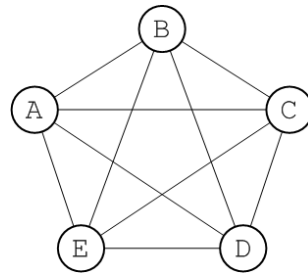


G3

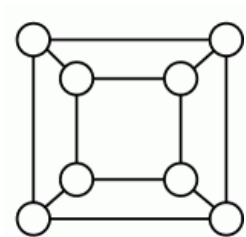
Question 10:- Determine whether each of the following graphs is bipartite or not then determine whether each one has an Euler circuit, Euler path or not. 6 points



G4



G5



G6

Question 11: The following cipher text was encrypted using RSA algorithm with public key $KEY(e=23, n=55)$, break the cipher and restore the original message. 5 points

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Good Luck

Sultan M. Al-Rushdan.