KING FAHD UNIVERISTY OF PETROLUEM AND MINERALS
INFORMATION & COMPUTER SCIENCE DEPT.
DHAHRAN, KSA

ICS 251 FOUNDATION OF COMPUTER SCIENCE
FALL 971

MAJOR EXAMINATION II

MAX. TIME ALLOWED 1:30 HOURS

NAME:_____ ID NO.:_____

SECTION: 1 OR 3

QUESTION	FULL MARKS	SCORE
1	21	
2	27	
3	12	
4	40	
TOTAL	100	

NOVEMBER 15, 1997

QUESTION 1 [21 points]
Define the following and give an example of each: [3 points each]

1 A partition or quotient set

2 If R is a relation from A to B and $x \in A$. Define the R(x), R-relative set of x.

3 Symmetric Relation R on A.

4 Reflexive Relation R on A.

5 Transitive Relation R on A.

6 Equivalence Relation R on A.

7 Symmetric closure of a Relation R on A.

QUESTION 2 [27 points]

Given the following two relations R and S on a set A = {1, 2, 3, 4, 6 }:
a R b if and only if a is a multiple of b, and a S b if and only if $a + b \leq 9$

Find:
[4 points]
a) Dom(R) =_____; Dom(S) = _____; Ran(R)= _____; Ran (S) =_____

[14 points: 2.5, 2.5, 3, 3, 3]
b) M_R = ; M_S = ; M_R^{-1} = ; $M_{R \cup S}$ = ; $M_{R \cap S}$ =

[9 points]
c) Is $M_{R \cup S} = M_R \vee M_S$? ; Is $M_{R \cap S} = M_R \wedge M_S$; Is $M_R^2 = M_R \circ M_S$

QUESTION 3 [12 points]

Let A= {a, b, c, d}, B = {1, 2, 3}, and C = { Ω , Δ , Φ}. Let R and S be the following relations from A to B and from B to C, respectively.

R = {(a,1), (a, 2), (b, 2), (b, 3), (c, 1), (d, 3), (d, 2)}
S = { (1, Ω), (2, Δ), (3, Δ), (1, Φ)}

a) Is (b, Δ) $\in$ S $\circ$ R ? [4 points]
b) Is (c, Δ) $\in$ S $\circ$ R ? [4 points]
c) Compute S $\circ$ R. [4 points]

QUESTION 4[40 points]

Let S = {1, 2, 3, 4} and let A = S X S. Define the following two relation R and S on A:

(a, b) R (a', b') if and only if a + b = a' + b'.
(a, b) S (a', b') if and only if a b' = a' b.

a) Show that R and S are equivalence relations. [20 points]
b) Show that R ∩ S is an equivalence relation. [10 points]
c) Is R ∪ S an equivalence relation in general ? If it is not an equivalence relation, give a counter example to show that R ∪ S is not an equivalence relation in general. [10 points]