October 3, 2002

cs330 – Discrete Structures

Fall 2002

Midterm
Closed books/notes

Starts: 8:35 am
Ends: 9:20 am

Name: _____(please print)
ID: _____

Problem	Max points	Your mark	Comments
1	10		10*1
2	8		8*1
3	5		
4	7		7*1
5	5		
6	15		5*3
Total	50		

1. Let $A = \{\{a, b\}, \{\}\}$. Decide whether the following statements are true (T) or false (F).

Statement	T/F
$a \in A$	
$\{a\} \subset A$	
$a \subset A$	
$\{a, b, \{\}\} \subset A$	
$\Phi \in A$	

Statement	T/F
$\Phi \subset A$	
$\{a\} \in$ powerSet(A)	
A has three elements	
$\{\{a, b, \{\}\}\} \in A$	
$A \in A$	

2. Let Q(x, y) be the statement "$x / y = 1$". If the universe of discourse for both variables is the set of integers, what are the truth values (T/F) of the following?

Statement	T/F
$Q(1,1)$	
$\forall y Q(1,y)$	
$\exists x \exists y Q(x,y)$	
$\exists x \forall y Q(x,y)$	

Statement	T/F
$Q(0,1)$	
$\exists x Q(x,1)$	
$\forall x \exists y Q(x,y)$	
$\forall x \forall y Q(x,y)$	

3. Decide whether the following argument is valid or not: "If I play baseball, then I am sore. I use the swimming pool if I am sore. I did not use the swimming pool. Therefore, I did play baseball".

4. Assume three sets, $A = \{\{a\}, b, c\}$, $B = \{a\}$, and $C = \{b, c, d, e\}$. The universal set is $U = \{a..z\}$ (the set of all lower case English alphabet letters). Calculate the following:

$A \cap C =$
$A - B =$
$A' =$
$(A \cap B)' =$
$(A \cup B)' =$
$A - (B - C) =$
$A - B' =$

5. Decide whether the relation represented by the matrix below is an equivalence relation or not. Explain.

```
| 1 0 1 |
| 0 1 1 |
| 1 1 0 |
```

6. Give a definition for:
a) Relation

b) Cartesian product of two sets

c) Alphabet

d) Implication

e) Syllogism