

**V1**

September 28, 1998

**cs330 - Discrete Structures**  
**Fall 1998****Midterm Exam**  
closed books, closed notesStarts: **9:00 am**Ends: **10:15 am**

Name: \_\_\_\_\_ (please print)

ID: \_\_\_\_\_

Problem	Max points	Your mark	Comments
1	10		10*1
2	5		
3	20		4*5
4	10		5+5
5	10		
6	30		6*5
	110		

1. Let  $A = \{\{a\}, \{\emptyset\}\}$ . Mark with true (T) or false (F) each of the following statements:

Statement	T/F
$a \notin A$	
$a \subseteq A$	
$\emptyset \subseteq A$	
$A \subseteq \emptyset$	
$\{\emptyset\} \in A$	

Statement	T/F
$\{a\} \in A$	
$\{a\} \subseteq A$	
$\{\emptyset\} \subseteq A$	
$ A  = 2$	
$\{A\} \subseteq \text{power}(A)$	

2. Find  $P(P(\{\emptyset\}))$ , where  $P$  denotes the power set of a set.

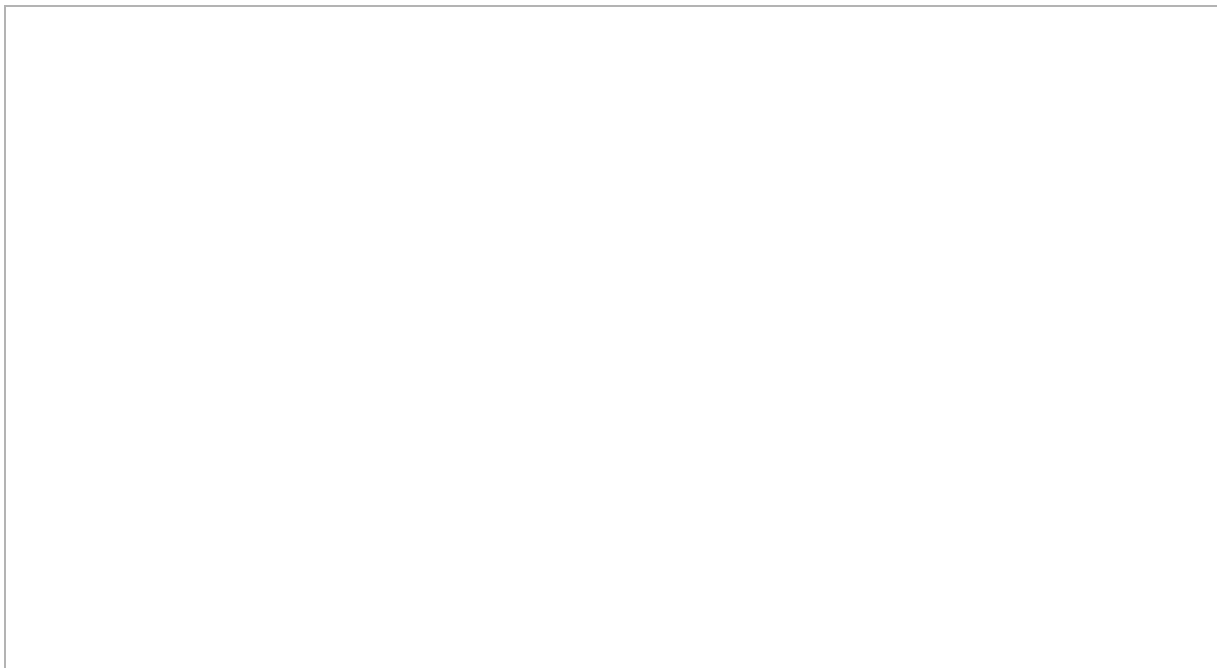
3. Let  $S$  be the set of all three letter strings over the alphabet  $\{a, b\}$ . A relation  $R$  on the set  $S$  is defined as follows: two elements of  $S$  are related iff they have a common substring of length two. For example **aab** and **baa** are related because they have in common the substring **aa** (of length two)

a) show the set representation of  $R$

b) show the matrix representation of  $R$ .



c) Show the digraph of  $R$



d) decide whether  $R$  is an equivalence relation or not. If it is, then show the partition it cre-

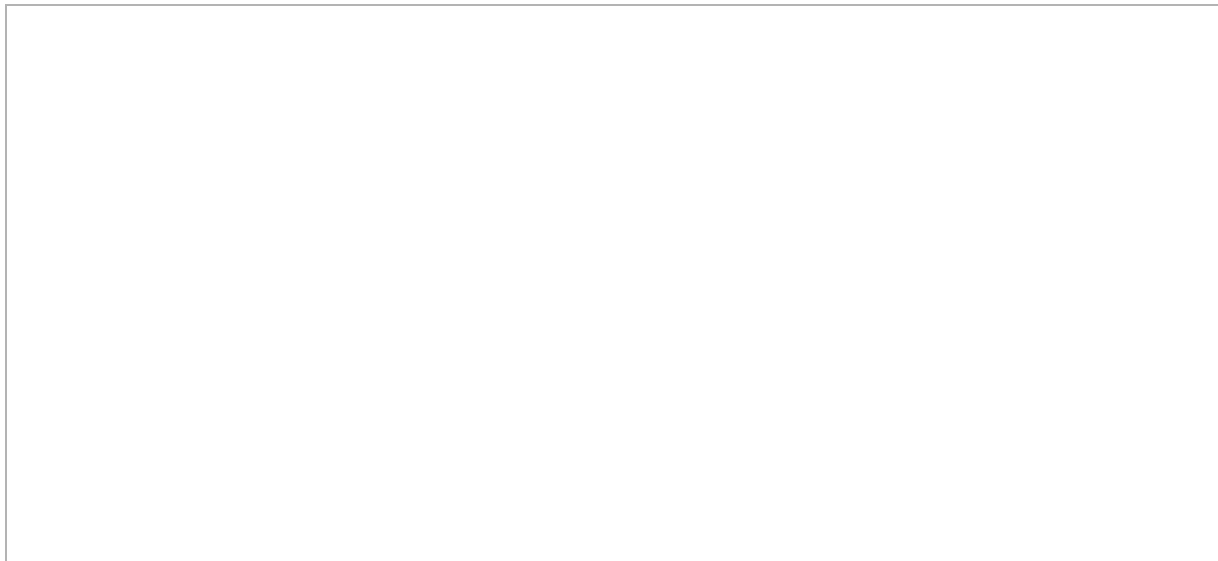
ates on  $S$ .



4. This is the postfix (reverse Polish) notation for an algebraic expression:

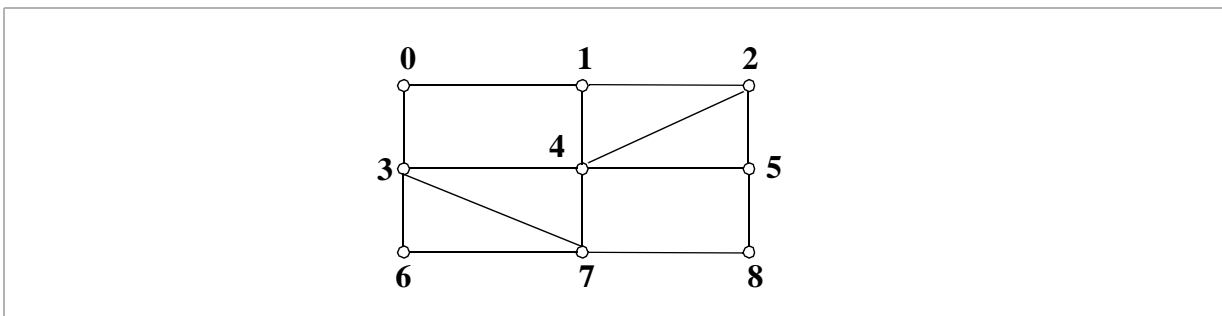
$$ab+2-a5+*$$

- a) Show the tree representation of this expression.



b) Show the corresponding algebraic expression

**5.** Let  $G$  be the graph below:



Do a graph traversal for  $G$  starting with the least significant digit of your SSN. Use a depth first algorithm with lexicographic ordering when choosing a vertex.

**6.** Give a definition for:

a) Set

b) Cartesian product

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c) Relation

d) Graph

e) Euler Path in a graph

f) Spanning tree