March 3, 1997

cs330 - Discrete Structures
Spring 1997

Midterm Exam
closed books, closed notes

V3

Starts: **10:10 am**
Ends**: 11:00 am**

Name:____________________________________(please print)

ID:____________________________ Section: __________

Problem	Max points	Your mark	Comments
1	10		10*1
2	8		4*2
3	12		3 + 2 + 2 + 5*1
4	5		3 + 2
5	10		4 + 6
6	15		5*3
7	5		3 + 2
	65		

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

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

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

2. For each integer i, define the set A_i as follows:

if i is odd then $\quad A_i = \{ x \mid x \in Z \text{ and } x < -i \text{ or } i < x \}$

if i is even then $\quad A_i = \{ x \mid x \in Z \text{ and } -i < x < i \}$

Describe each of the sets:

a) A_0

b) A_2

c) A_{-3}

d) Find the union of the sets A_i, $i \in \{0, 2, -3\}$

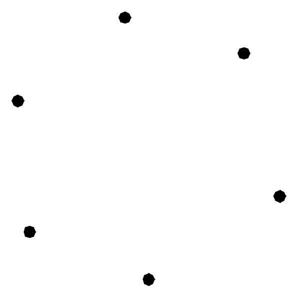
3. Let $S = \{1, 2, 3, 4, 5, 6\}$ and a relation R on S defined as

$a\ R\ b$ if and only if $(a+b) \leq 5,\ a, b \in S$

a) show the set representation of R

b) show the matrix representation of R. Show the digraph of R

The matrix of R.



The digraph of R

c) mark with true (T) or false (F) the following statements. If your answer is true then give an example

Statement	Your answer	Example
There is a cycle in the digraph		
There is a path of length 3 in the digraph of R		
There is a sink in the digraph		
There is a source in the digraph		
The digraph is connected		

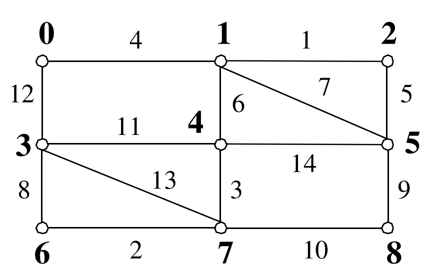
4. This is the postfix (reverse Polish) notation for an algebraic expression:

`ab*cd*ef-+-a*`

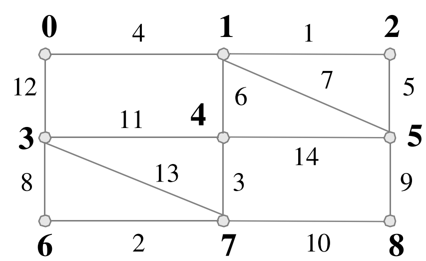
a) Show the tree representation of this expression.

b) Show the corresponding algebraic expression

5. Let G be the graph below:



a) Construct a spanning tree for this graph starting with the vertex given by SSN **mod** 9, where SSN is your Social Security Number. Use a depth first algorithm with lexicographic ordering when choosing a vertex .



b) Construct a minimum spanning tree for the graph. Use the page attached to this exam to show each step of the process. Indicate what algorithm you are using.

6. Give a definition for:

a) set

b) relation

c) Cartesian product

d) graph

e) spanning tree

7. Explain the difference between:

a) an Euler cycle and a Hamiltonian cycle in a connected, undirected graph

b) a set and a list

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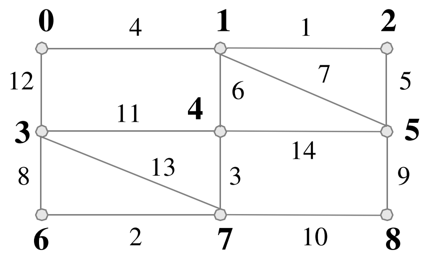
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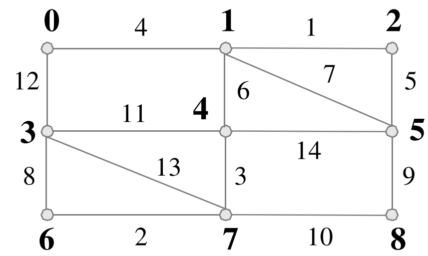
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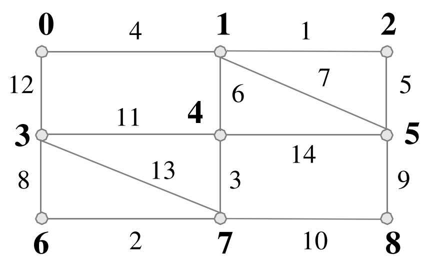
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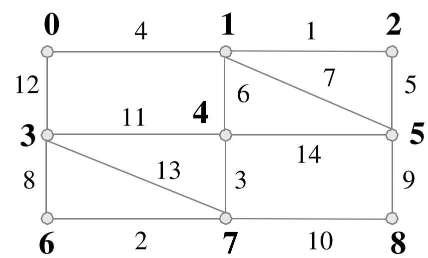
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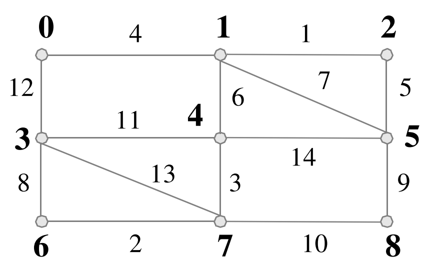
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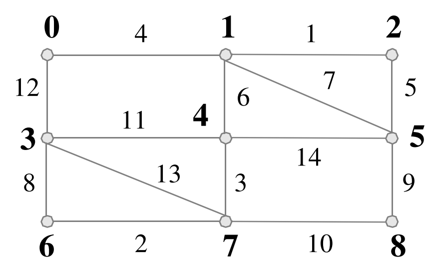
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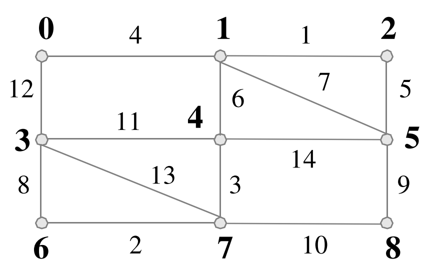
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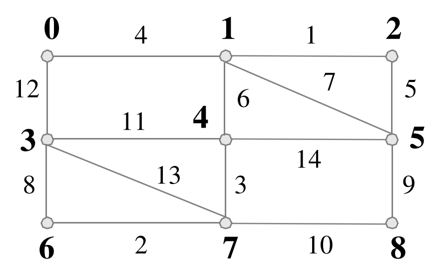
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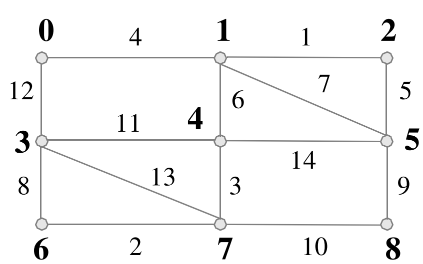
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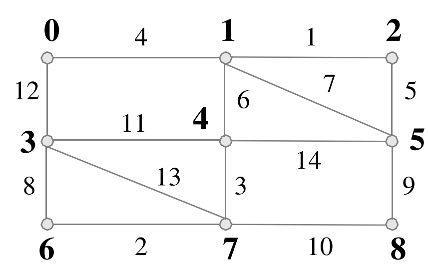
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