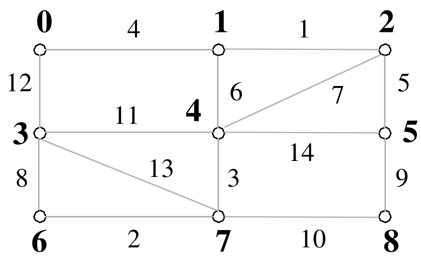
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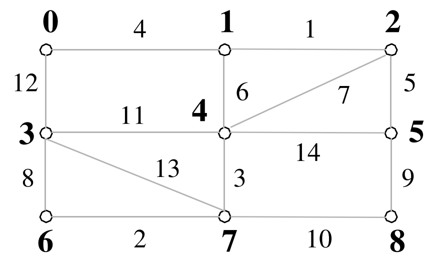
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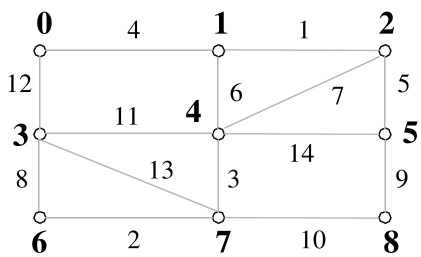
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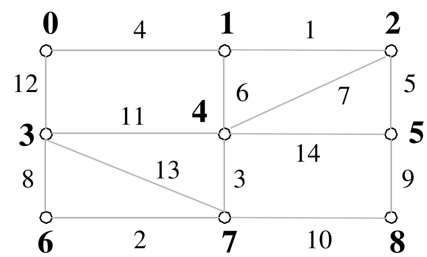
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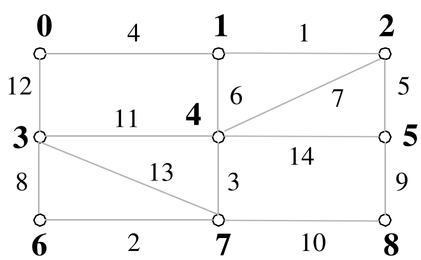
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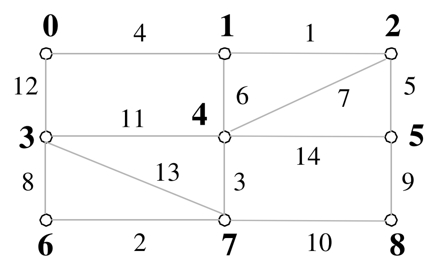
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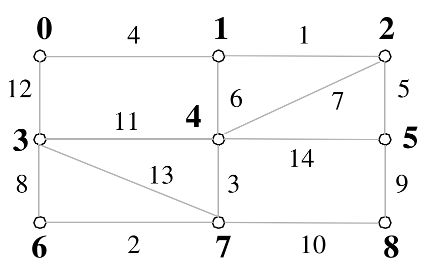
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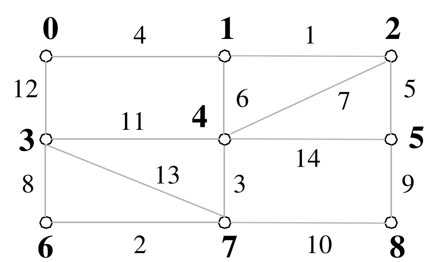
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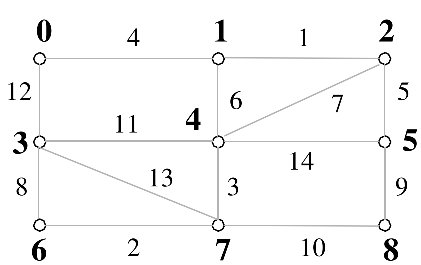
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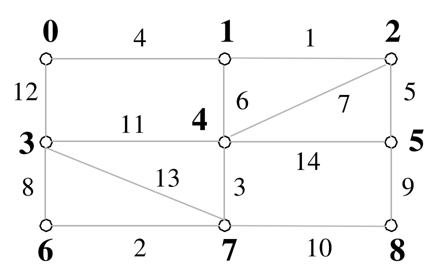

0 4 1 1 2
12 6 7 5
11 4
3 5
13 14
8 3 9
6 2 7 10 8

g) Alphabet

h) String

.

b) Cartesian product

c) Relation

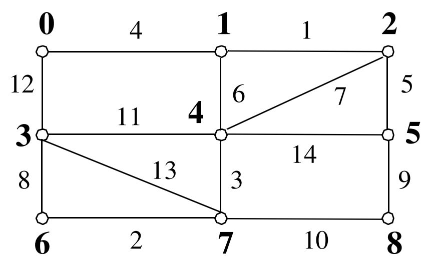
d) Function

e) Graph

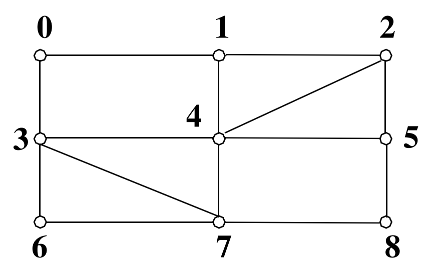
f) Spanning tree

b) Show the corresponding algebraic expression

7. Let G be the graph below:



a) Construct a spanning tree for this graph starting with the vertex given by the last digit (rightmost) of 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 using Prim's algorithm. Use the page attached to this exam to show each step of the process.

8. Give a definition for:

a) Set

5. Determine whether the following argumentation is correct or not: “Logic is difficult or many students like logic. If mathematics is easy, then logic is not difficult. Therefore, if many students like logic, then mathematics is not easy”.

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

```
abc/-a2/3+*
```

a) Show the tree representation of this expression.

c) Show the digraph of R

d) decide whether R is an equivalence relation or not. If it is, then show the partition it creates on S.

4. Let S be the set of all three letter strings over the alphabet $\{0, 1\}$. 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 **`001`** and **`100`** are related because they have in common the substring **`00`** (of length two)

a) show the set representation of R

b) show the matrix representation of R.

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
$\{a\} \in A$	
$\{a\} \subseteq A$	
$\{\varnothing\} \subseteq A$	
$\lvert A \rvert = 2$	
$\{A\} \subseteq \text{power}(A)$	

2. A *boolean function* is a function whose domain and codomain is the set $\{0, 1\}$. List all boolean functions of one variable.

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

V1

October 6, 1997

cs330 - Discrete Structures
Fall 1997

Midterm Exam
closed books, closed notes

Starts: **9:00 am** Ends**: 10:15 am**

Name:_________________________________(please print)

ID:______________________

Problem	Max points	Your mark	Comments
1	10		10*1
2	15		
3	5		
4	25		5+5+5+10
5	10		10*1
6	10		5+5
7	15		5+10
8	40		8*5
	130		