

Student Name: _____	CISC 203 Discrete Mathematics for Computing Science
Student Number: _____	Test 5 Fall 2010
	Professor Mary McCollam

**Please write in pen and only in the box marked “Answer”.**

This is a closed-book exam. No computers or calculators are allowed.

**Question 1: [10 marks]**

( a ) Show that the relation  $R$  on the set of all bit strings such that  $s R t$  if and only if  $s$  and  $t$  contain the same number of 1s is an equivalence relation.

**Answer:**

( b ) List the ordered pairs in the equivalence relation on the set  $\{ 0, 1, 2, 3, 4 \}$  formed by the partition  $\{ (0, 1, 2), (3, 4) \}$ .

**Answer:**

**Question 2: [10 marks]**

( a ) Assume  $S$  is the set of all people in the world. Consider  $( S, R )$ , with  $( a, b ) \in R$ , where  $a$  and  $b$  are people and either  $a = b$  or  $a$  is a descendant of  $b$ .

**Answer:**

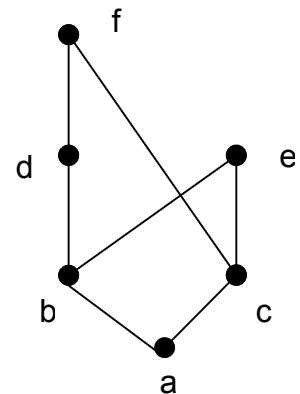
i) Is  $( S, R )$  a poset? Why or why not?

ii) Is  $( S, R )$  a totally ordered set? Why or why not?

( b ) In the poset represented by the following Hasse diagram, identify the:

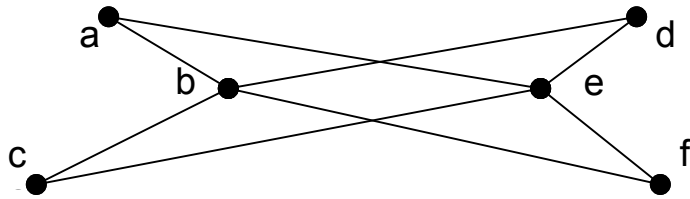
**Answer:**

- i) maximal and minimal elements
- ii) greatest element, if it exists
- iii) least element, if it exists
- iv) lower bounds of  $\{ b, f \}$
- v) greatest lower bound of  $\{ b, f \}$ , if it exists



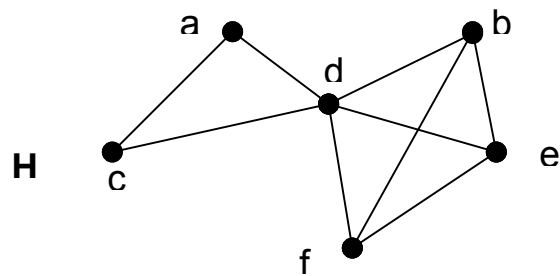
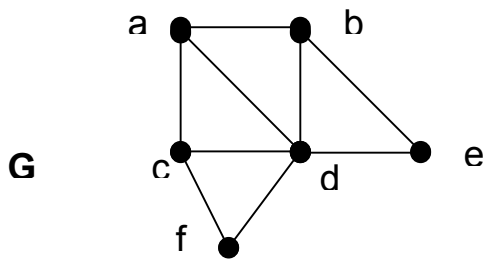
**Question 3: [10 marks]**

( a ) Determine whether the following graph is bipartite. Justify your answer.



**Answer:**

( b ) Determine whether the following pair of graphs are isomorphic. Exhibit an isomorphism or provide a rigorous argument that none exists.



**Answer:**

**Question 4: [10 marks]** Use Huffman coding to encode these symbols with given frequencies: A: 0.10, B: 0.25, C: 0.05, D: 0.15, E: 0.30, F: 0.07, G: 0.08.

**Answer:**