Name: _____ Student Number: _____	CISC 203 Discrete Mathematics for Computing Science Test 5, Fall 2009 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) [6 marks] Show that the relation
$D = \{ (x,y) \mid x - y \text{ is an integer} \}$
Is an equivalence relation on the set of real numbers.

Answer:

(b) [4 marks] Describe the equivalence class of each of 0 and 0.5 for the relation *D*.

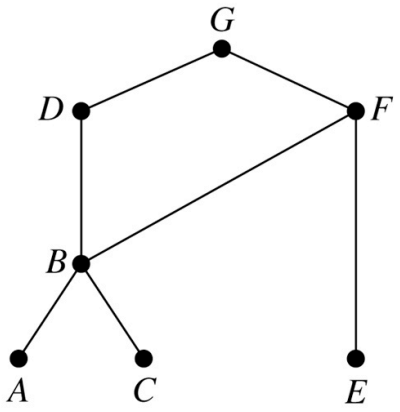
Answer:

Question 2: [10 marks]

a) [4 marks] Is ($\mathcal{Z}$, ≥) a poset, where $\mathcal{Z}$ is the set of integers? Why or why not?

Answer:

b) [6 marks] In the poset represented by the Hasse diagram below, identify the:



Answer:

i) maximal and minimal elements

ii) greatest and least elements, if they exist

iii) upper bounds of { b, c }

iv) least upper bound of { b, c } if it exists

v) lower bounds of { d, g, f }

vi) greatest lower bound of { d, g, f } if it exists

Question 3: [10 marks]

a) Draw the two undirected graphs represented by the following adjacency matrices.

$$\begin{bmatrix} 0 & 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 & 0 \end{bmatrix} \quad \begin{bmatrix} 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 & 1 \\ 1 & 1 & 0 & 1 & 0 \end{bmatrix}$$

Answer:

b) Determine whether these two graphs are isomorphic. Exhibit an isomorphism or provide a rigorous argument that none exists.

Answer:

Question 4: [10 marks]

a) Which complete bipartite graphs $K_{m,n}$, where m and n are positive integers, are trees?

Answer:

b) Show the result of inserting, 8, 5, 7, 3, 4, 9, 2 sequentially (one at a time), in an initially empty binary search tree.

Answer: