King Saud University

Department of Mathematics

2nd Semester 1436-1437 H

MATH 151 (Discrete Mathematics)

2nd Midterm Exam

Duration: 90 Minutes

Name:

Sequence Number:

Teacher's Name:

Section:

Question	Mark
Question I	
Question II	
Question III	
Total	

Question Number	1	2	3	4	5	Total
Answer						

Question I:

Choose the correct answer, then fill in the table above:

(1) Which of the following is a partition of the set {-3,-2, 0, 1,2}:

(a) {{-3,0,1},{1},{2, -2}} (b) {{-3, 0, 1, 2}, {-2}}

(c) {{-3}, {1,2}, {0}} (d) None of the previous

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(2) Let $R_1 = \{(a,b) \in \mathbb{R}^2 : a \neq b\}$ and $R_2 = \{(a,b) \in \mathbb{R}^2 : a < b\}$, then $R_1 - R_2 =$

(a) ϕ (b) R_1 (c) $\{(a,b) \in \mathbb{R}^2 : a > b\}$ (d) None of the previous

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(3) The reflexive closure of the relation $R = \{(1,2),(2,3),(2,1)\}$ defined on the set $A = \{1,2,3\}$ equals:

(a) $\{(1,1),(2,2),(3,3)\}$ (b) $\{(3,2),(1,1),(2,2),(3,3)\}$

(c) $\{(1,2),(2,3),(2,1),(1,1),(2,2),(3,3)\}$ (d) None of the previous

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(4) For the equivalence relation on $\mathbb{Z}$ defined by $a \equiv b(mod 8)$:

(a) $[2] = [10]$ (b) $[2] = [8]$ (c) $[1] = [8]$ (d) None of the previous

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(5) In the set of positive integers with division relation ($\mathbb{Z}^+$, |), 4 and 8 are:

(a) comparable (b) incomparable (c) None of the previous

Question II:

A. Let **R** be a relation defined on the set of integers $\mathbb{Z}$ by $\mathbf{R} = \{(a, b) : a^2 = b^2\}$. Then answer the following:

(i) Prove that **R** is an equivalence relation on $\mathbb{Z}$.

(ii) Find the equivalence classes [5] and $[x]$ where $x \in \mathbb{Z}$.

B. Find the transitive closure of the relation $R = \{(1,1), (1,2), (1,3), (2,1), (4,4)\}$ defined on the set $A = \{1, 2, 3, 4\}$.

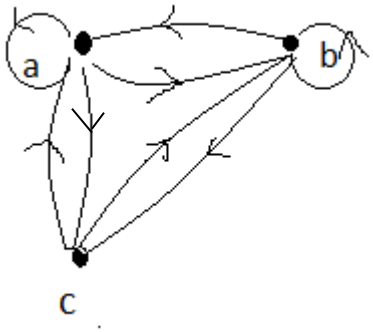
Question III:

A. Prove that $(\mathbb{Z}, \geq)$ is a poset. Is it totally ordered? Justify your answer.

B. Draw the Hasse diagram for the relation R on the set $\{1,2,4,5,8,10,16,20,40\}$ given by:

$$aRb \iff a \; divides \; b.$$

C. The following diagraph represents a relation R on {a, b, c}. Answer the following:



(i) Is *R* reflexive? Justify your answer.

(ii) Is *R* symmetric? Justify your answer.

(iii) Is *R* antisymmetric? Justify your answer.

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Good Luck☺