Summary in Graph

Exam Summary (GO Classes Test Series 2024 | Discrete Mathematics | Test 2)

Qs. Attempted:	**11** 5 + 6	**Correct Marks:**	**11** 3 + 8
Correct Attempts:	**7** 3 + 4	**Penalty Marks:**	**0** 0 + 0
Incorrect Attempts:	**4** 2 + 2	**Resultant Marks:**	**11** 3 + 8

Total Questions:	**15** 5 + 10
Total Marks:	**25** 5 + 20
Exam Duration:	45 Minutes
Time Taken:	45 Minutes

EXAM RESPONSE EXAM STATS FEEDBACK

Technical

Q #1 Multiple Choice Type Award: 1 Penalty: 0.33 Set Theory & Algebra

Let A and B be arbitrary sets and consider the set S defined below:

$$S = \{x \mid \neg(x \in A \rightarrow x \in B)\}$$

What is the correct expression for S in terms of A and B using the standard set operators?

A. $A \cup B$
B. $A \cap B$
C. $A \backslash B$
D. $B \backslash A$

Your Answer: C Correct Answer: C Correct Discuss

Q #2 Numerical Type Award: 1 Penalty: 0 Set Theory & Algebra

Let $A = \{1, 2, 3, 4, 5\}$ and $B = \{2, 3, 4\}$. How many sets C have the property that $C \subseteq A$ and $B \subseteq C$?

Your Answer: 4 Correct Answer: 4 Correct Discuss

Q #3 | Multiple Select Type | Award: 1 | Penalty: 0 | Set Theory & Algebra

Suppose that S and T are sets. Which of the following first-order logic statements are translations of the statement " S is not a subset of T ?" Check all that apply.

A. $\forall x.(x \in S \rightarrow x \notin T)$
B. $\forall x.(x \in S \wedge x \notin T)$
C. $\exists x.(x \in S \rightarrow x \notin T)$
D. $\exists x.(x \in S \wedge x \notin T)$

Your Answer: C;D | Correct Answer: D | Incorrect | Discuss

Q #4 | Numerical Type | Award: 1 | Penalty: 0 | Set Theory & Algebra

Given a set of values $\mathrm{R}=\{1,2,3,4,5,6,7\}$. The number of relations on this set which are both partial-order and equivalence relation is?

Your Answer: 128 | Correct Answer: 1 | Incorrect | Discuss

Q #5 | Multiple Choice Type | Award: 1 | Penalty: 0.33 | Set Theory & Algebra

Let R be a relation from a set A to a set B. The inverse relation from B to A, denoted by R^{-1}, is the set of ordered pairs $\{(b, a) \mid (a, b) \in \mathrm{R}\}$.

- $\mathrm{S1}$: R is reflexive relation iff $\mathrm{R}^{-1}=\mathrm{R}$
- $\mathrm{S2}$: R is a symmetric relation iff $\mathrm{R}^{-1}=\mathrm{R}$

Which one of the following statements is true?

A. Only $\mathrm{S1}$
B. Only $\mathrm{S2}$
C. Both $\mathrm{S1}$ and $\mathrm{S2}$
D. None of the above

Your Answer: B | Correct Answer: B | Correct | Discuss

Q #6 | Multiple Choice Type | Award: 2 | Penalty: 0.67 | Set Theory & Algebra

Let f be a function from a set X to a set Y. Consider the following statements.

- P : For each $x \in X$, there exists $y \in Y$ such that $f(x)=y$.
- Q : For each $y \in Y$, there exists $x \in X$ such that $f(x)=y$.
- R : There exist $x_1, x_2 \in X$ such that $x_1 \neq x_2$ and $f(x_1)=f(x_2)$.

The negation of the statement " f is one-to-one and onto Y " is

A. P or not R
B. R or not P
C. R or not Q
D. P and not R

Your Answer: C | Correct Answer: C | Correct | Discuss

Q #7 | Multiple Select Type | Award: 2 | Penalty: 0 | Set Theory & Algebra

Let's suppose that we have a function $f : \mathbb{R} \to \mathbb{R}$. We'll say that f is an odd function if the following is true:

$$\forall x \in \mathbb{R}.\ f(-x) = -f(x)$$

We can define even functions as follows. A function $f : \mathbb{R} \to \mathbb{R}$ is called even if the following is true:

$$\forall x \in \mathbb{R}.\ f(-x) = f(x)$$

Which of the following statements is/are correct?

A. If $f : \mathbb{R} \to \mathbb{R}$ and $g : \mathbb{R} \to \mathbb{R}$ are odd, then $g \circ f$ is also odd.
B. If $f : \mathbb{R} \to \mathbb{R}$ is odd and is a bijection, then f^{-1} is also odd.
C. If $f : \mathbb{R} \to \mathbb{R}$ is an even function, then f is not a bijection.
D. Let $f : \mathbb{R} \to \mathbb{R}$ be any function. Then $g : \mathbb{R} \to \mathbb{R}$ defined as $g(x) = f(x) - f(-x)$ is odd.

Your Answer: A;B;C;D | **Correct Answer: A;B;C;D** | Correct | Discuss

Q #8 | Multiple Select Type | Award: 2 | Penalty: 0 | Set Theory & Algebra

Let R be an equivalence relation on a non-empty set A. Let $a, b \in \mathrm{A}$.

For any $x \in A$, let $[x]$ denote the equivalence class of R containing x.

Which of the following is/are correct statements?

A. $a\mathrm{R}b$ iff $[a] = [b]$
B. $a\mathrm{R}b$ iff $[a] \cap [b] \neq \phi$
C. If A is non-empty finite set then R can never have more than $|\mathrm{A}|$ equivalence classes, where $|\mathrm{A}|$ is the cardinality of A.
D. $\mathrm{R} = \mathrm{A} \times \mathrm{A}$ iff R has only one equivalence class.

Your Answer: A;B;C;D | **Correct Answer: A;B;C;D** | Correct | Discuss

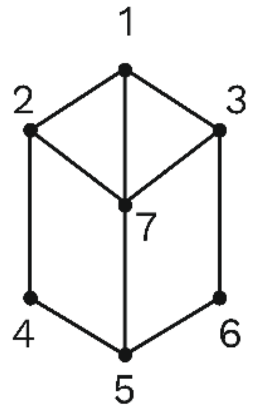
Q #9 | Numerical Type | Award: 2 | Penalty: 0 | Set Theory & Algebra

Let A, B be two non-empty sets, with cardinality $3, 4$ respectively. Let R be a relation defined on the power set of $\mathrm{A} \times \mathrm{B}$. Relation R is reflexive, symmetric, transitive, and antisymmetric. Hence, Relation R is also equivalence relation. The cardinality of the largest equivalence class of relation R is?

Your Answer: | **Correct Answer: 1** | Not Attempted | Discuss

Q #10 | Multiple Select Type | Award: 2 | Penalty: 0 | Set Theory & Algebra

Consider the Hasse diagram shown below-



Which of the following is/are true about the lattice L that is represented by the above Hasse diagram:

A. L is a distributive lattice.
B. L is a complemented lattice.
C. The subset $\{1,2,3,4,5,6\}$ is a sub-lattice of L under the same relation.
D. The subset $\{1,3,4,5,6\}$ is a sub-lattice of L under the same relation.

Your Answer: A;C | **Correct Answer: D** | Incorrect | Discuss

Q #11 | Multiple Select Type | Award: 2 | Penalty: 0 | Set Theory & Algebra

A relation on an n-element set $\mathrm{A}=\{a_0,a_1,\ldots,a_{n-1}\}$ can be represented by an $n \times n$ adjacency matrix of Boolean values.

$$\left[\begin{array}{c|cccc} & a_0 & a_1 & \cdots & a_{n-1} \\ \hline a_0 & b_{0,0} & b_{0,1} & \cdots & b_{0,n-1} \\ a_1 & b_{1,0} & b_{1,1} & \cdots & b_{1,n-1} \\ \vdots & \vdots & \vdots & \cdots & \vdots \\ a_{n-1} & b_{n-1,0} & b_{n-1,1} & \cdots & b_{n-1,n-1} \end{array}\right]$$

where the entries $b_{i,j}$ are Boolean values such that $b_{i,j}=1$ if a_i is related to a_j and $b_{i,j}=0$ otherwise.

Which of the following is/are correct about the matrix representation of various types of relations?

A. For antisymmetric relation, for all $0 \leq i,j \leq n-1$, exactly one of the entries $b_{i,j}, b_{j,i}$ is 1.
B. For reflexive relation, there are at least n 1-entries in the adjacency matrix.
C. The number of 1-entries in the adjacency matrix is the cardinality of the relation.
D. For symmetric relation, for all $0 \leq i,j \leq n-1, b_{i,j}=b_{j,i}$.

Your Answer: | **Correct Answer: B;C;D** | Not Attempted | Discuss

Q #12 | Multiple Choice Type | Award: 2 | Penalty: 0.67 | Set Theory & Algebra

For any set X, let $|\mathrm{X}|$ be the cardinality of set X. Let A and B be two finite sets such that $|\mathrm{A}|=|\mathrm{B}|$. There is a one to one function f from A to B.

Which of the following must be true for f?

- $\mathrm{S1}$: f is onto function
- $\mathrm{S2}$: f has an inverse

A. Only $\mathrm{S1}$

B. Only $\mathrm{S2}$
C. Both $\mathrm{S1}$ and $\mathrm{S2}$
D. None of the above

Your Answer: C | Correct Answer: C | Correct | Discuss

Q #13 | Multiple Select Type | Award: 2 | Penalty: 0 | Set Theory & Algebra

Let L be a lattice $[\mathrm{S}, \#]$, where S is the base set and $\#$ is a relation defined on S. If for every subset A of S, $[\mathrm{A}, \#]$ is also a lattice then L must be?

A. Total order
B. Bounded lattice
C. Distributive lattice
D. Boolean lattice

Your Answer: | Correct Answer: A;C | Not Attempted | Discuss

Q #14 | Multiple Select Type | Award: 2 | Penalty: 0 | Set Theory & Algebra

A binary relation R on a set A is called connected iff for all elements x and y of A, either $x\mathrm{R}y$ or $y\mathrm{R}x$ or both. i.e. R is connected iff $\forall x, y \in \mathrm{A}((x\mathrm{R}y) \vee \ (y\mathrm{R}x))$

Which of the following is/are true ?

A. Every connected relation is reflexive.
B. Every connected relation is partial order.
C. Every connected relation is symmetric.
D. Every connected relation is transitive.

Your Answer: A;B;D | Correct Answer: A | Incorrect | Discuss

Q #15 | Multiple Select Type | Award: 2 | Penalty: 0 | Set Theory & Algebra

In set theory, an urelement or ur-element is an object that is not a set, but that may be an element of a set. It is also referred to as an atom or individual. In this case, if X is an urelement, it makes no sense to say $y \in \mathrm{X}$, although $\mathrm{X} \in \mathrm{U}$ is perfectly legitimate.

Let A be any set in which every element is ur-element.

- We define set B which is union of A and power set of A.
- We define a relation R on B as following : $a\mathrm{R}b$ if and only if $a \in b$.

Which of the following properties is/are satisfied by R?

A. Reflexivity
B. Symmetric
C. Transitive
D. Anti-symmetric

Your Answer: | Correct Answer: C;D | Not Attempted | Discuss