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**PRESIDENCY UNIVERSITY
BENGALURU**

SCHOOL OF ENGINEERING

Winter Semester: 2021- 22
Course Code: CSE 2016
Course Name: Discrete Mathematical Structures
Program: B.Tech & IV Sem

TEST 1

Date: 26th April 2022
Time: 03:00 PM to 04:00 PM
Max Marks: 30
Weightage: 15%

Instructions:

- (i) Read all the questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.

Part A [Memory Recall Questions]

Answer all the questions. Each question carries two marks. (3Q x 2M = 6M)

1. Write the following statement in symbolic form :
"I do not fail the course if and only if I study hard and I pass the final exam".
(C.O.No.1) [Knowledge]
2. Give the inverse and converse of the statement "If oxygen is a gas, then Gold is a compound".
(C.O.No.1) [Knowledge]
3. Let $Q(x)$ be the statement " $x < 3$ ". What is the truth value of the quantification $\forall x, Q(x)$, where the domain consists of all real numbers? (C.O.No.1) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the questions. Each question carries five marks. (3Q x 5M = 15M)

4. Construct truth table for $[\neg(p \vee q) \vee (\neg p \wedge q)] \vee p$ and check whether it is a tautology or contradiction. (C.O.No.1) [Comprehension]
5. Obtain the principal disjunctive normal form of the formula $p \vee (p \wedge q) \Leftrightarrow p$ without constructing the truth table. (C.O.No.1) [Comprehension]
6. Show that $(\forall x)(P(x) \rightarrow Q(x)) \wedge (\forall x)(Q(x) \rightarrow R(x)) \Rightarrow (\forall x)(P(x) \rightarrow R(x))$. (C.O.No.1) [Comprehension]

Part C [Problem Solving Questions]

Answer the following question. The question carries nine marks. (1Q x 9M = 9M)

7. Verify the validity of the argument, "Rita is baking a cake. If Rita is baking a cake, then she is not practicing her flute. If Rita is not practicing her flute, then her father will not buy her a car. Therefore, Rita's father will not buy her a car".
(C.O.No.1) [Comprehension]



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BENGALURU**

SCHOOL OF ENGINEERING

TEST 1

Winter Semester: 2021-22
Course Code: CSE2016
Course Name: Discrete Mathematical Structures
Program : B.Tech & IV Sem

Date: 09/05/2022
Time: 1:30 PM to 2:30 PM
Max Marks: 30
Weightage: 15%

Instructions:

- (i) Read all the questions carefully and answer accordingly.
 - (ii) Question paper consists of 3 parts.
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Part A [Memory Recall Questions]

Answer all the questions. Each question carries two marks. (3Q x 2M = 6M)

1. How can the following English sentence be translated into a logical expression?
"You can access the internet from campus only if you are a computer science major or you are not a freshman."
(C.O.No.1) [Knowledge]
2. Give the converse and contrapositive of the following implication :
"If it is raining, then I get wet".
(C.O.No.1) [Knowledge]
3. Express the statement, "Some lions do not drink coffee" using predicates and quantifiers.
(C.O.No.1) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the questions. Each question carries five marks. (3Q x 5M = 15M)

4. Construct truth table for $[(p \wedge (p \rightarrow q)) \rightarrow q]$ and check whether it is a tautology or contradiction.
(C.O.No.1) [Comprehension]
5. Obtain the principal conjunctive normal form of the formula $(\neg p \rightarrow r) \wedge (q \leftrightarrow p)$ without constructing the truth table.
(C.O.No.1) [Comprehension]
6. Show that $(\forall x)[H(x) \rightarrow M(x)], H(s) \Rightarrow M(s)$.
(C.O.No.1) [Comprehension]

Part C [Problem Solving Questions]

Answer the following question. The question carries nine marks. (1Q x 9M = 9M)

7. Verify the validity of the argument "If Sachin takes aptitude test, then he will qualify for placements. If Sachin does not play cricket, then he will take aptitude test. Sachin is disqualified from placements. Therefore, Sachin played cricket."
(C.O.No.1) [Comprehension]



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PRESIDENCY UNIVERSITY
BENGALURU
SCHOOL OF ENGINEERING

TEST 2

Winter Semester: 2021-22
Course Code: CSE2016
Course Name: Discrete Mathematical Structures
Program: B.Tech & IV Sem

Date: 1st June 2022
Time: 03:00 PM to 04:00 PM
Max Marks: 30
Weightage: 15%

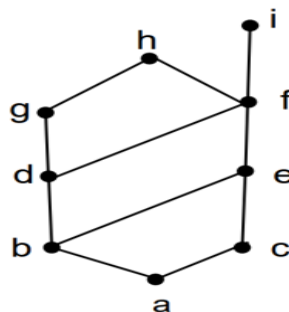
Instructions:

- (i) Read all the questions carefully and answer accordingly.
 - (ii) Question paper consists of 3 parts.
-

Part A [Memory Recall Questions]

Answer ALL the questions. Each question carries TWO marks. (3Q x 2M = 6M)

1. Let f and g be functions from the set of integers to itself defined by $f(x) = x - 1$ and $g(x) = 3x$. (a) What is the composition of f and g ? (b) What is the composition of g and f ? (C.O.No.2) [Knowledge]
2. What are the equivalence classes of 2 and 3 for congruence modulo 4? (C.O.No.2) [Knowledge]
3. Identify the lower bounds and greatest lower bound of $\{b, d, g\}$ if they exist for the poset represented in the following Hasse diagram. (C.O.No.3) [Knowledge]



Part B [Thought Provoking Questions]

Answer ALL the questions. Each question carries FIVE marks. (3Q x 5M = 15M)

4. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = ax + b$, for $a, b \in \mathbb{R}$ and $a \neq 0$. Verify f is a bijection. (C.O.No.2) [Comprehension]
5. Suppose that $A = \{1, 2, 3, 4\}$ and let R be the relation from A to A such that $R = \{ (a, b) \mid a, b \in A \text{ and } a \leq b \}$. (a) What are the elements in the relation R ? (b) What is the matrix representing R ? (c) Draw the directed graph for elements of R . (C.O.No.2) [Comprehension]
6. Determine whether the poset $(\{1, 2, 4, 8, 16\}, |)$ is a lattice. (C.O.No.3) [Comprehension]

Part C [Problem Solving Questions]

Answer the following question. The question carries NINE marks. (1Q x 9M = 9M)

7. Let R denote the relation “congruence modulo m ” over the set of positive integers. Verify R is an equivalence relation. (C.O.No.2) [Comprehension]

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**PRESIDENCY UNIVERSITY
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SCHOOL OF ENGINEERING

END TERM EXAMINATION

Winter Semester: 2021-22
Course Code: CSE2016
Course Name: Discrete Mathematical Structures
Program: B.Tech & IV Sem

Date: 29th June 2022
Time: 09:30 AM to 12:30 PM
Max Marks: 100
Weightage: 50%

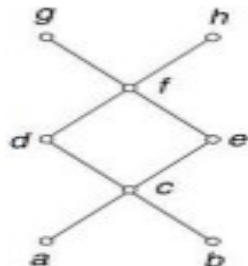
Instructions:

- (i) Read all the questions carefully and answer accordingly.
- (ii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer ALL the questions. Each question carries TWO marks. (10Q x 2M = 20M)

- Express the following sentence into a logical expression: "You can access the internet only if you are a computer science major or you are not a freshman."
(C.O.No.1) [Knowledge]
- For the conditional statement "If file system is not locked then new messages will be queued", write the converse and contrapositive.
(C.O.No.1) [Knowledge]
- What is the power set of the set $S = \{ 0, \emptyset, \{\emptyset\} \}$?
(C.O.No.2) [Knowledge]
- The value of the floor function at $- 8.6$, i.e., $\lfloor - 8.6 \rfloor$ is _____ and the value of the ceiling function at $- 7.4$, i.e., $\lceil - 7.4 \rceil$ is _____.
(C.O.No.2) [Knowledge]
- Represent the relation $R = \{ (a, b) \mid a \text{ divides } b \}$ defined on the set $A = \{1, 2, 3, 4\}$, in the form of a matrix.
(C.O.No.2) [Knowledge]
- Let $R = \{ (1, 2), (3, 4), (2, 2) \}$ and $S = \{ (4, 2), (2, 5), (3, 1), (1, 3) \}$ be relations.
(a) What is the composition of R and S? (b) What is the composition of S and R?
(C.O.No.2) [Knowledge]
- For the given Hasse diagram, identify the maximal and minimal elements.



(C.O.No.3) [Knowledge]

8. Define a total ordered set. (C.O.No.3) [Knowledge]
9. What are the values of y which satisfy the linear congruence $3y \equiv 4 \pmod{7}$? (C.O.No.4) [Knowledge]
10. The number of r -permutations with no repetition is _____ and the number of r -combinations with repetition is _____. (C.O.No.4) [Knowledge]

Part B [Thought Provoking Questions]

Answer ALL the questions. Each question carries TEN marks. (5Q x 10M = 50M)

11. Verify that $p \vee (q \wedge r)$ and $(p \vee q) \wedge (p \vee r)$ are logically equivalent. (C.O.No.1) [Comprehension]
12. Establish the validity of the following argument: "All integers are rational numbers. Some integers are powers of 2. Therefore, some rational numbers are powers of 2". (C.O.No.1) [Comprehension]
13. The function $f : \mathbb{R} \rightarrow \mathbb{R}$ is defined by $f(x) = 2x + 1$, for $x \in \mathbb{R}$. Show that f is invertible and find the inverse of f . (C.O.No.2) [Comprehension]
14. Let R be the relation on the set of ordered pairs of positive integers such that $((a, b), (c, d)) \in R$ if and only if $a + d = b + c$. Verify that R is an equivalence relation. (C.O.No.3) [Comprehension]
15. a) What is the least number of area codes needed to guarantee that the 25 million phones in a state can be assigned distinct 10-digit telephone numbers? (Assume that telephone numbers are of the form $NXX-NXX-XXXX$, where the first three digits form the area code, N represents a digit from 2 to 9 inclusive, and X represents any digit.)
- b) How many ways are there to distribute 5 cards to each of four players from the standard deck of 52 cards? (C.O.No.4) [Comprehension]

Part C [Problem Solving Questions]

Answer both the questions. Each question carries FIFTEEN marks.

(2Q x 15M = 30M)

16. Consider the poset (P, \leq) , where $P = \{1, 2, 3, 5, 30\}$ and the partial ordered relation \leq is defined as $x \leq y$ if and only if " x divides y ". Show that the poset (P, \leq) is a lattice. Hence verify that the lattice is a distributive lattice. (C.O.No.3) [Comprehension]
17. a) Solve the system of congruences $x \equiv 2 \pmod{3}$, $x \equiv 3 \pmod{5}$ and $x \equiv 2 \pmod{7}$.
- b) Solve the recurrence relation $a_n = 6a_{n-1} - 9a_{n-2}$. (C.O.No.4) [Comprehension]