

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2024.

First Semester

Computer Science

Elective — DISCRETE MATHEMATICS

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. A _____ is an ordered collection of objects.
- (a) relation
(b) function
(c) set
(d) preposition

7. A compound proposition that is neither a tautology nor a contradiction is called a _____.

- (a) Contingency (b) Equivalence
(c) Condition (d) Inference

8. Which of the following is true for matrices?

- (a) $(AB)^{-1} = B^{-1} A^{-1}$ (b) $(A^{-1}) = A$
(c) $AB = BA$ (d) $A * 1 = 1$

9. Which of the following matrix is Skew Symmetric?

- (a) $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$
(c) $\begin{bmatrix} 0 & 3 \\ -1 & 9 \end{bmatrix}$ (d) $\begin{bmatrix} 8 & -2 \\ -1 & 3 \end{bmatrix}$

10. Which of the following is the formula for calculating the inverse of the matrix?

- (a) $\frac{2}{|A|} adj A$ (b) $\frac{1}{|A|} adj A$
(c) $\frac{-1}{|A|} adj A$ (d) $\frac{1}{|2A|} adj A$

2. Which of the following two sets are equal?

- (a) $A = \{1, 2\}$ and $B = \{1\}$
(b) $A = \{1, 2\}$ and $B = \{1, 2, 3\}$
(c) $A = \{1, 2, 3\}$ and $B = \{2, 1, 3\}$
(d) $A = \{1, 2, 4\}$ and $B = \{1, 2, 3\}$

3. Let $P = \{(x, y) : x^2 + y^2 = 1, x, y \in R\}$. Then, P is

- (a) Reflexive (b) Symmetric
(c) Transitive (d) Anti-Symmetric

4. Suppose a relation $R = \{(3, 3), (5, 5), (5, 3), (5, 5), (6, 6)\}$ and $S = \{3, 5, 6\}$. Here R is known as _____.

- (a) equivalence relation
(b) reflexive relation
(c) symmetric relation
(d) transitive relation

5. $p \wedge q$ is logically equivalent to _____.

- (a) $\neg(p \rightarrow \neg q)$ (b) $(p \rightarrow \neg q)$
(c) $(\neg p \rightarrow \neg q)$ (d) $(\neg p \rightarrow q)$

6. If A is any statement, then which of the following is a tautology?

- (a) $A \wedge F$ (b) $A \vee F$
(c) $A \vee \neg A$ (d) $A \wedge T$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) (i) What is an ordered pair?
(ii) Define Cartesian product.

Or

- (b) Describe :
(i) Cardinality of a set
(ii) Power set.

12. (a) Define and represent Relation and function.

Or

- (b) What is equivalence relations? Give example.

13. (a) Write note on basic set of logical operators.

Or

- (b) What is commutative law? Solve $P \vee Q ? Q \vee P$ using commutative law.

14. (a) Define Matrix. Mention its type.

Or

- (b) Define Transpose of a matrix. How to find the transpose of a matrix?

15. (a) Calculate the adjoint of the matrix

$$A = \begin{bmatrix} 1 & -1 & 2 \\ 2 & 3 & 5 \\ 1 & 0 & 3 \end{bmatrix}$$

Or

- (b) Find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 4 \\ 0 & 0 & 1 \end{bmatrix}$

using the formula,

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Illustrate about specification of sets.

Or

- (b) What is identify of sets? Explain.

17. (a) Define function. Describe about representation of function.

Or

- (b) Let $A = \{2, 3, 4\}$ and $B = \{2, 6, 8\}$. Let $R : A$ to B . For all $(a, b) \in A \times B$, $a R b \Leftrightarrow a | b$. Determine R and R^{-1} . Draw arrow diagrams for both. Describe R^{-1} in words.

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18. (a) What are the operations of propositions? Explain.

Or

- (b) Write about tautology. Prove that the statement $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$ is a tautology.

19. (a) (i) Define skew symmetric matrix.

(ii) $A = \begin{bmatrix} 0 & -3 & 2 \\ a+2 & 0 & 3 \\ -2 & b-3 & 0 \end{bmatrix}$ is a skew

symmetric matrix, then find the values of a and b .

Or

- (b) (i) Properties of conjugate of a matrix

- (ii) Find the conjugate of the matrix

$$A = \begin{bmatrix} 1+2i & 3-i & 4 \\ -2i & 5i & 6-3i \\ 7 & 8+2i & 9i \end{bmatrix}$$

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20. (a) Determine whether the given matrix is a Singular matrix or not

$$\begin{bmatrix} 2 & 4 & 6 \\ 2 & 0 & 2 \\ 6 & 8 & 14 \end{bmatrix}$$

Or

- (b) Find the inverse $A = \begin{bmatrix} 4 & 3 & 8 \\ 6 & 2 & 5 \\ 1 & 5 & 9 \end{bmatrix}$ of a matrix.