

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2023.

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)

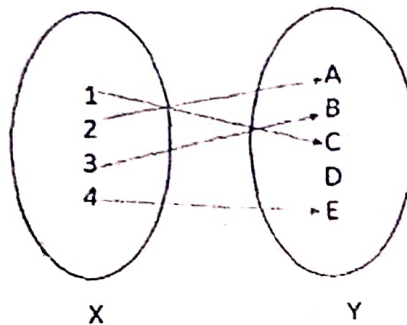
Answer ALL the questions.

Choose the correct answer :

- If x is a set and the set contains an integer which is neither positive nor negative then the set x is _____
(a) Set is Empty
(b) Set is Non-empty
(c) Set is Finite
(d) Set is both non-empty and finite

- Which of the following statement is a proposition?
(a) Give me a glass of milkshake
(b) God bless you !
(c) What is the time now?
(d) The only odd prime number is 2
- $p \rightarrow q$ is logically equivalent to _____
(a) $\neg p \vee \neg q$ (b) $p \vee \neg q$
(c) $\neg p \vee q$ (d) $\neg p \wedge q$
- A compound proposition that is neither a tautology nor a contradiction is called a _____
(a) Contingency (b) Equivalence
(c) Condition (d) Inference
- What is the canonical form of the matrix $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$?
(a) $x + xy + y^2$ (b) $x^2 + xy$
(c) $x^2 + y^2$ (d) $x^2 + xy + y^2$
- Which of the following matrix are singular?
(a) $\begin{bmatrix} 31 & 12 \\ 26 & 8 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 11 \\ 2 & 8 \end{bmatrix}$
(c) $\begin{bmatrix} 13 & 12 \\ 22 & 8 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & 12 \\ 2 & 8 \end{bmatrix}$

- Which of the following is a subset of set $\{1, 2, 3, 4\}$?
(a) $\{1, 2\}$ (b) $\{1, 2, 3\}$
(c) $\{1\}$ (d) All of the mentioned
- The following figure depicts which type of function?



- one-one
 (b) onto
 (c) many-one
 (d) both one-one and onto
- The relation $R = \{(1, 1), (2, 2), (3, 3)\}$ on set $\{1, 2, 3\}$ is :
 (a) symmetric only
 (b) reflexive only
 (c) an equivalence relation
 (d) transitive only

- Which of the below condition is incorrect for the inverse of a matrix A ?
(a) The matrix A must be a square matrix
(b) A must be singular matrix
(c) A must be a non-singular matrix
(d) $\text{adj } A \neq 0$

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

- (a) (i) What is Cartesian product?
 (ii) Prove that $A \times (B \cap C) = (A \times B)(A \times C)$.
 Or
 (b) Define sets and elements.
- (a) Define and differentiate relation and function.
 Or
 (b) Find the inverse of $h(x) = x^3 + 2$.
- (a) Write note on basic set of logical operators.
 Or
 (b) Solve using truth table
 $p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$.

14. (a) Mention the different operations of matrices.

Or

(b) Find the determinant of the matrix

$$\begin{bmatrix} 1 & 0 & 3 \\ -1 & -1 & -3 \\ 0 & 0 & 6 \end{bmatrix}.$$

15. (a) Let $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & 4 \\ 1 & 4 & 3 \end{bmatrix}$ then find $\text{adj } A$.

Or

(b) What is Singular Matrix? Describe it.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Explain about operations on set.

Or

(b) Write about :

(i) Equality of set

(ii) Proper set.

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17. (a) (i) Define Relation on set.

(ii) $A = \{0, 1, 2, 3\}$, $R = \{(0, 0), (0, 1), (0, 3),$

$(1, 0), (1, 1), (2, 2), (3, 0), (3, 3)\}$. Is R reflexive, symmetric and transitive?

Or

(b) Write in detail about classification of function.

18. (a) Write the truth table for :

(i) negation

(ii) conjunction

(iii) disjunction

(iv) implication

(v) bidirectional

Or

(b) Show that the assertion $(P \& (\neg Q \vee \neg R)) \Rightarrow (P \Rightarrow \neg Q)$ is neither a tautology nor a contradiction.

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19. (a) $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 1 & 3 \\ 1 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 0 & 1 & 1 \end{bmatrix}$. Find

A^T, B^T and verify that

(i) $(A+B)^T = A^T + B^T$

(ii) $(AB)^T = B^T A^T$

(iii) $(2A)^T = 2A^T$.

Or

(b) (i) Add and subtract the complex matrix

$$a = \begin{pmatrix} 2+i & 5i \\ 3 & 3-4i \end{pmatrix} \quad b = \begin{pmatrix} 1-i & 4+2i \\ 1-6i & 3 \end{pmatrix}.$$

(ii) Find the determinant of the matrix

$$\begin{pmatrix} 1 & 2 & 1 \\ 0 & 3 & 4 \\ 3 & 1 & 4 \end{pmatrix}.$$

20. (a) What is inverse of A ? $A = \begin{bmatrix} 1 & 0 & -1 \\ 3 & 4 & 5 \\ 0 & -6 & -7 \end{bmatrix}$.

Or

(b) List the Inverse Matrix Properties.

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