

Seat No.

January - February (Winter) Examination - 2023

Subject Name: B.C.A. (CBCS)_80872_Mathematical Foundations for Computer Applications_30.01.2023_10.30 AM To 01.30 PM

Subject Code: 80872

Day and Date: Monday, 30-01-2023
Time: 10:30 am to 01:30 pm

Total Marks: 70

Instructions:

1) Figures to the right indicate full marks

Special Instruction:

Que. 1 and Que. 6 are compulsory and attempt any three questions from Que. No. 2 to Que.

No. 5

Q.1.

[20]

A) Select the correct alternative and rewrite the statement (10 Marks):

- 1) If $U = \{1,2,3,4,5,6\}$, $A = \{2,3\}$ and $B = \{3,4,5\}$ then $(A \cup B) =$ _____.
 A) $\{1,2,5,6\}$ B) $\{1,5,6\}$ C) $\{3,4\}$ D) $\{1,6\}$
- 2) If $A = \{a, b\}$, $B = \{x, y\}$ then $A \times B =$ _____.
 A) $\{(a, x), (a, y), (b, x), (b, y)\}$ B) $\{(x, a), (y, a), (x, b), (y, b)\}$
 C) $\{(a, b), (x, y)\}$ D) $\{(b, a), (y, x)\}$
- 3) _____ is the associative law for three sets A, B and C.
 A) $A \cup (B \cap C) = (A \cup B) \cap C$ B) $A \cup (B \cup C) = (A \cup B) \cup C$
 C) $A \cap (B \cup C) = (A \cap B) \cup C$ D) $A \cap (B \cap C) = (A \cap B) \cap C$
- 4) If p is a true statement and q is a false statement then statements $p \wedge q$ and $\sim p \wedge \sim q$ are _____.
 A) both true statements B) both false statements
 C) $p \wedge q$ is false and $\sim p \wedge \sim q$ is true statement D) none of these
- 5) If $A = \begin{bmatrix} 1 & 0 \\ -4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ -1 & -6 \end{bmatrix}$ then $2A - 3B =$ _____.
 A) $\begin{bmatrix} 4 & 9 \\ 5 & -24 \end{bmatrix}$ B) $\begin{bmatrix} -4 & 9 \\ 5 & 24 \end{bmatrix}$ C) $\begin{bmatrix} -4 & -9 \\ -5 & -24 \end{bmatrix}$ D) $\begin{bmatrix} -4 & -9 \\ -5 & 24 \end{bmatrix}$
- 6) A diagonal matrix having all of its elements are equal is called as _____ matrix.
 A) unit B) null C) scalar D) singular
- 7) If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$, then $A^2 =$ _____.
 A) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ B) $\begin{bmatrix} 2 & 2 & 2 \\ 2 & 2 & 2 \\ 2 & 2 & 2 \end{bmatrix}$ C) $\begin{bmatrix} 3 & 3 & 3 \\ 3 & 3 & 3 \\ 3 & 3 & 3 \end{bmatrix}$ D) $\begin{bmatrix} 3 & 2 & 2 \\ 2 & 3 & 2 \\ 2 & 2 & 3 \end{bmatrix}$
- 8) The contrapositive of "if p then q" is _____.
 A) "if q then p" B) "if $\sim p$ then $\sim q$ " C) "if $\sim q$ then $\sim p$ " D) $\sim q \vee p$
- 9) A graph that does not have any loops or parallel edges is called _____.
 A) multigraph B) pseudograph C) simple graph D) trivial graph
- 10) Number of edges incident with the vertex v of a Graph G is called _____.
 A) degree of a Graph G B) degree of a vertex v
 C) Handshaking Lemma D) none of these

B) Attempt any two of the following : (10 Marks)

- 1) Define : (i) Equality of sets, (ii) Union of two sets, (iii) Empty set.
- 2) If $A = \begin{bmatrix} 1 & 0 \\ -4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ -1 & -6 \end{bmatrix}$ then find (i) $2A - 3B$ and (ii) $A + 2A^T$.
- 3) Prove that the statement $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$ is a tautology.

Q.2. Define Cartesian product of two sets. If $P = \{1, 2, 3\}$ and $Q = \{4, 5, 6\}$ then [10] determine Cartesian product $P \times Q$ and $Q \times P$.

- Q.3. Define converse, inverse and contrapositive of the conditional statement $p \rightarrow q$ [10]
. Write each of the following statements in its equivalent contrapositive form:
(i) If Howard can swim across the lake, then Howard can swim to the island.
(ii) If today is Easter, then tomorrow is Monday.

- Q.4. . [10]

Define (i) Unit matrix and (ii) Null matrix. If $A = \begin{bmatrix} 4 & 0 \\ 1 & -2 \end{bmatrix}$, then prove that $A^2 - 2A - 8I = O$, where O is the null matrix of the order same as matrix A .

- Q.5. Define : (i) Simple graph, (ii) Multigraph, (iii) Pseudo graph, (iv) Degree of vertex of a graph, (v) Isolated vertex of a graph, (vi) Pendant vertex of a graph. [10]

- Q.6. Write note on any four of the following : [20]
(a) Operations on sets.
(b) Determinant of second and third order.
(c) Relations and Functions.
(d) Valid and Invalid arguments.
(e) Elementary row and column transformations.
(f) Directed graph.