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Brainware University
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Kolkata, West Bengal-700125

BRAINWARE UNIVERSITY

Term End Examination 2024-2025

Programme – Dip.CE-2024/Dip.CSE-2024/Dip.EE-2024/Dip.ME-2024/Dip.RA-2024

Course Name – Mathematics - I

Course Code - DBS00001

(Semester I)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

(i) If $C = \begin{vmatrix} 1 & 2 & 3 \\ -3 & 0 & -1 \\ 5 & -6 & 7 \end{vmatrix}$, then identify the co-factor of the element 2.

- a) 6
b) -16
c) 14
d) 16

(ii) Select the value of $\lim_{x \rightarrow 3} \frac{x-3}{x^2-2x-3}$.

- a) 0
b) 1
c) $\frac{1}{4}$
d) none

(iii) If $\tan \theta = 3$, then the select the value of $\cos 2\theta$.

- a) $-\frac{4}{5}$
b) $\frac{4}{3}$
c) $\frac{1}{3}$
d) $\frac{2}{3}$

(iv) Select the value of $2 \sin 30^\circ \cos 30^\circ$.

- a) $\frac{1}{2}$
b) 1
c) $\frac{\sqrt{3}}{2}$
d) none

(v) Select the value of $\sin \left(x - \frac{\pi}{2} \right)$.

- a) $\sin x$ b) $-\sin x$
c) $\cos x$ d) $-\cos x$
- (vi) If $\sin x = \frac{3}{4}$ then select the value of $\cos x$.
- a) $\frac{2}{3}$ b) $\frac{\sqrt{3}}{2}$
c) $\frac{\sqrt{7}}{4}$ d) $\frac{1}{2}$
- (vii) Identify the value of $\begin{vmatrix} 3 & 2 \\ 2 & 1 \end{vmatrix}$.
- a) 0 b) -1
c) 19 d) none
- (viii) Identify the nature of the matrix $\begin{pmatrix} 2 & 0 \\ 6 & 9 \end{pmatrix}$.
- a) a diagonal matrix b) an upper triangular matrix
c) a lower triangular matrix d) a symmetric matrix
- (ix) If $\begin{bmatrix} x+3 & x+2y \\ z-1 & 4t-6 \end{bmatrix} = \begin{bmatrix} 0 & 7 \\ 3 & 2t \end{bmatrix}$, then identify the value of x, y, z, t are respectively.
- a) 3, -2, -4, 3 b) -3, 5, 4, 3
c) -3, 2, 4, -3 d) none
- (x) Choose the value of the determinant $\begin{vmatrix} 1 & \cos 60^\circ & \cos 30^\circ \\ \frac{1}{2} & \sin 30^\circ & \sin 60^\circ \\ 1 & 0 & 2 \end{vmatrix}$.
- a) $\frac{\sqrt{3}}{2}$ b) $\frac{1}{2}$
c) 0 d) none
- (xi) Choose the nature of the transpose of a square matrix from below options.
- a) scalar matrix b) square matrix
c) diagonal matrix d) rectangular matrix
- (xii) If the difference of the roots of the $x^2 + px + 8 = 0$ be 2 then select the value of p .
- a) ± 4 b) ± 10
c) ± 9 d) ± 6
- (xiii) If $x = a \cos t$ and $y = b \sin t$, then calculate the value of $\frac{dy}{dx}$.
- a) $\frac{b}{a} \cot t$ b) $\frac{a}{b} \cot t$
c) $-\frac{b}{a} \cot t$ d) $\frac{b}{a} \tan t$
- (xiv) Calculate the value of $\frac{d}{dx}(\sin x^\circ)$.
- a) $\cos x^\circ$ b) $\cos x$
c) $\cos \frac{x}{\pi}$ d) $\frac{\pi}{180} \cos x^\circ$
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9. Show that any square matrix can be uniquely expressed as the sum of a symmetric and a skew-symmetric matrix. (5)

10. If the co-ordinate of two points A and B are (1,6,5) and (-7,5,2) respectively then identify the value of $\vec{AB}$. (5)

11. Examine the nature of the roots of the equation $3x^2 - 10x + 3 = 0$. (5)

12. If $B = \begin{pmatrix} -1 & 3 & 5 \\ 1 & -3 & -5 \\ -1 & 3 & 5 \end{pmatrix}$ and $C = \begin{pmatrix} 2 & -2 & 4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{pmatrix}$, evaluate the value of $6B+C$. (5)

OR

If $B = \begin{pmatrix} -1 & 3 & 5 \\ 1 & -3 & -5 \\ -1 & 3 & 5 \end{pmatrix}$ and $C = \begin{pmatrix} 2 & -2 & 4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{pmatrix}$, evaluate the value of $B-6C$. (5)

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