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BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – Dip.CSE-2024/Dip.EE-2024/Dip.ME-2024/Dip.RA-2024/Dip.CSE-2025/Dip.EE-2025/Dip.ME-2025
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) Identify the correct value for logarithm of 1728 to the base $2\sqrt{3}$.

a) 3 b) 6
c) 9 d) none

(ii) Identify the value of $\log_{\frac{27}{25}} \times \log_{\frac{5}{3}} =$

a) 6 b) $\frac{9}{2}$
c) $\frac{3}{2}$ d) none

(iii) Identify the value of log 1 .

a) $\frac{1}{2}$ b) $\frac{1}{3}$
c) $\frac{1}{4}$ d) 0

(iv) Choose the value of $(1-\omega)(1-\omega^2)(1+\omega^8)(1+\omega^4) =$

a) 1 b) 2
c) 4ω d) 3

(v) Choose the value of $(2+i)(3+2i)(4-7i)$.

a) 6 b) 60
c) 65 d) 100

(vi) If |A| = 0, then choose the nature of A.

a) diagonal matrix
b) zero matrix
c) singular matrix
d) non-singular matrix

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(vii) Choose the nature of the matrix $\begin{pmatrix} -3 & 0 \\ 0 & 4 \end{pmatrix}$.

a) a diagonal matrix
b) an upper triangular matrix
c) a lower triangular matrix
d) a symmetric matrix

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

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

(ix) Select the value of $2 \sin 30° \cos 30°$.

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

(x) Select the value of $\sin 15° \cos 15° + \sin 15° \cos 15°$.

a) $\frac{1}{2}$
b) 1
c) 0
d) none

(xi) 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

(xii) Choose the value of $\begin{vmatrix} 5 & 6 \\ -1 & 2 \end{vmatrix}$.

a) 14
b) 16
c) 2
d) none

(xiii) If $x = a \sin\theta, y = a \cos\theta$ then select the value of $\frac{dy}{dx}$.

a) $a \sec^2 \theta$
b) $\sec^2 \vartheta$
c) ab
d) none

(xiv) Select the value of $\frac{d}{dx}(\sin^{-1} x)$.

a) $\frac{1}{\sqrt{(1-x^2)}}$
b) $\frac{2}{\sqrt{1-x^2}}$
c) $\frac{2}{\sqrt{1+x^3}}$
d) $-\frac{2}{\sqrt{1+x^2}}$

(xv) If $\begin{bmatrix} 4 & 8 \\ 0 & 12 \end{bmatrix} = \begin{bmatrix} x & 8 \\ 0 & 4y \end{bmatrix}$, then identify the values of x, y respectively.

a) 4, 3
b) -3, 5
c) -3, 2
d) none

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Convert: (2 + 3i)(1 - 4i) and express the result in the form a + bi. (3)

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3. Identify the value of the limit: $\lim_{x \to 0} x \cos\frac{1}{x}$ (3)

4. Let, (3)

$$f(x)=\begin{cases} x, & 0<x<1 \\ 2-x, & 1 \le x \le 2 \\ x-x^2, & x>2 \end{cases}$$

Examine that f(x) discontinuous at x=2.

5. Identify the area of the triangle with vertices A (1,1,2), B (2,3,5) and C (1,5,5). (3)

6. (3)

Evaluate the value of $\frac{d}{dx}(x^2e^x)$.

OR

Evaluate the value of $\frac{d}{dx}(x\ cosx)$. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Identify the value of K so that the function $f(x) = \begin{cases} Kx^2 + 2x, & x < 2 \\ Kx^3, & x \ge 2 \end{cases}$ is continuous at x=2. (5)

8. Identify the value of the limit: $\lim_{x \to 10}(11x^5 + 3e^x + 2)$ (5)

9. Show that any square matrix can be uniquely expressed as the sum of a symmetric and a skew-symmetric matrix. (5)

10. Evaluate the angle between two given vectors i-j+k and i-2j+3k. (5)

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

(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.

OR

(5)

If $A = \begin{pmatrix} -10 & 3 & 5 \\ 1 & -13 & -5 \\ -1 & 0 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} 26 & -2 & 4 \\ -1 & 31 & 4 \\ 0 & -2 & -3 \end{pmatrix}$, evaluate the matrix A.B.

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