BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – Dip.CSE-2022/Dip.EE-2022/Dip.CE-2022/Diploma in Robotics & Automation-2023/Dip.CE-2023/Dip.CSE-2023/Dip.EE-2023/Dip.ME-2023
Course Name – Mathematics-I
Course Code - BS102
(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 $y = \frac{b}{a}x$, then calculate the value of $\frac{dy}{dx} =$

a) $\frac{a}{b}$ b) a

c) ab d) $\frac{b}{a}$

(ii) If $\vec{\alpha} = 3i + 4j + 2k$ and $\vec{\beta} = 3i - j + k$ then identify the value of $\vec{\alpha}.\vec{\beta} =$

a) 5 b) -1

c) 4 d) 7

(iii) Identify the value of i^2?

a) 1/2 b) 1/3
c) 1/4 d) -1

(iv) If $x = a\,sint\,, y = b\,cost$ then calculate the value of $\frac{dy}{dx} =$

a) $\frac{b}{a}\cot t$

b) $\frac{a}{b}\cot t$

c) $\frac{-b}{a}cosec^2 t$

d) $\frac{b}{a}\tan t$

(v) Identify the Modulus of $\frac{3+4i}{4-3i}$ is

a) i

b) 1

c) 7

d) None of these

(vi) Determine the value of the determinant $\begin{vmatrix} 1 & 2 & 3 \\ 0 & 0 & 0 \\ 3 & 6 & 9 \end{vmatrix}$ is

a) 4

b) 0

c) -1

d) none

(vii) Identify the value of $\sin\left(x - \frac{\pi}{2}\right) = ?$

a) sinx

b) -sinx

c) cosx

d) -cosx

(viii) Identify the value of $2 \sin 30° \cos 30°$

a) $\frac{1}{2}$

b) 1

c) $\frac{\sqrt{3}}{2}$

d) none of these

(ix) Identify the correct value for logarithm of 1728 to the base $2\sqrt{3}$

a) 3

b) 6

c) 9

d) None of these

(x) If $y = \tan^{-1}\frac{\cos x}{1+\sin x}$, then calculate the value of $\frac{dy}{dx} =$

a) 1

b) $\frac{1}{2}$

c) $-\frac{1}{2}$

d) 2

(xi) If $\log_x^{81} = 4$ then identify the value of x=

a) 1
b) 2
c) 3
d) None

(xii) If the difference of the roots of the $x^2 + px + 8 = 0$ be then determine the value of p

a) ± 4
b) ± 10
c) ± 9
d) ± 6

(xiii) Identify the value of $\lim_{x \to 3} \frac{x-3}{x^2-2x-3} =$

a) 0
b) 1
c) 1/4
d) none

(xiv) Identify the value of $\log_c^a \times \log_a^b \times \log_b^c =$

a) a^2
b) abc
c) 1
d) 0

(xv) Identify the value of $\frac{\sin(A-B)}{\sin A . \sin B} =$

a) cot A-cot B
b) cot B-cot A
c) cot A+cot B
d) none of these

Group-B
(Short Answer Type Questions) 3 x 5=15

2. Identify the value of the limit : $\lim_{x \to 0}(x^2 + x)$ (3)

3. 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) is discontinuous at x=2.

4. Show that $\tan^{-1}1+\tan^{-1}\frac{1}{2}+\tan^{-1}\frac{1}{3}=\frac{\pi}{2}$ (3)

5. If $A=\begin{pmatrix}2&-3&-5\\-1&4&5\\1&-3&-4\end{pmatrix}$, $B=\begin{pmatrix}-1&3&5\\1&-3&-5\\-1&3&5\end{pmatrix}$ write the matrix AB. (3)

6. The co-ordinate of two points A and B are (1,2,5) and (-18,5,3) respectively then evaluate the value of $\vec{AB}$? (3)

OR

Evaluate the magnitude of vector, $v=\frac{1}{3}i+\frac{1}{3}j+\frac{1}{3}k$? (3)

Group-C
(Long Answer Type Questions) 5 x 6=30

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

8. If $f(x)=\log\frac{1+x}{1-x}$ examine that $f\left(\frac{2x}{1+x^2}\right)=2f(x)$. (5)

9. Identify the value of the limit $\lim_{x\to\infty}\frac{3x^5+5x+2}{2x^5-2x+2}$ (5)

10. If $C=\begin{pmatrix}2&-2&4\\-1&3&4\\1&-2&-3\end{pmatrix}$, identify the value of $C+C^T$? (5)

11. If $\sin x = \frac{4}{5}$ then identify the value of $\cos x$? (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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