



BRAINWARE UNIVERSITY

Term End Examination 2022

Programme – Dip.CSE-2018/Dip.EE-2018/Dip.ECE-2019/Dip.CSE-2019/Dip.ME-2019/Dip.CSE-2020/Dip.CSE-2021/Dip.EE-2021/Dip.ME-2021/Dip.CSE-2022/Dip.ME-2022/Diploma in Robotics & Automation-2022/Dip.EE-2022/Dip.CE-2022

Course Name – Mathematics I/Mathematics-I

Course Code - DMAT010101/DECE104/DCSE104/DME104/DEE104/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) Observe the value of $\log_8 \sqrt{8} =$

- a) 1/3
- c) 1/2

- b) 1/4
- d) 1/8

(ii) If $x = a \sec^2 \theta$, $y = b \tan^2 \theta$, then write the value of $\frac{dy}{dx} =$

- a) a/b
- c) ab

- b) a
- d) b/a

(iii) If $x = a \cos t$ and $y = b \sin t$, then write 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) $\frac{b}{a} \tan t$

(iv) If $y = \tan^{-1} \frac{\cos x}{1 + \sin x}$, then evaluate $\frac{dy}{dx} =$

- a) 1
- c) -1/2

- b) 1/2
- d) 2

(v) Evaluate $\frac{d}{dx} \left\{ \cos^{-1} \frac{x}{5} \right\} =$

a) $\frac{1}{\sqrt{25-x^2}}$

b) $\frac{1}{\sqrt{25+x^2}}$

c) $\frac{1}{\sqrt{25-x^2}}$

d) $\frac{1}{\sqrt{25-x^2}}$

(vi)

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If $C = \begin{vmatrix} 1 & 2 & 3 \\ -3 & 0 & -1 \\ 5 & -6 & 7 \end{vmatrix}$, then evaluate the co-factor of the element 2 is

- a) 6
c) 14

- b) -16
d) 16

(vii)

Determine the value of $\begin{vmatrix} 1 & 1 & 1 \\ 4 & 6 & 9 \\ 5 & 6 & 7 \end{vmatrix}$

- a) 0
c) 19

- b) -1
d) none

(viii)

Determine the value of $\begin{vmatrix} 1 & -2 & 3 \\ 2 & -1 & 4 \\ -2 & 3 & 1 \end{vmatrix}$

- a) 20
c) 19

- b) 13
d) none

(ix)

Determine the value of $\begin{vmatrix} 1 & 2 & 3 \\ 0 & 5 & 6 \\ 4 & 6 & 8 \end{vmatrix}$

- a) 0
c) 2

- b) 1
d) none of these

(x)

If $A = \begin{bmatrix} 0 & -1 \\ 1 & 3 \\ 2 & 0 \end{bmatrix}$, then evaluate $2A^T =$

a)

$$\begin{bmatrix} 0 & 2 & 4 \\ -2 & 6 & 0 \end{bmatrix}$$

b)

$$\begin{bmatrix} 0 & -2 \\ 2 & 6 \\ 4 & 0 \end{bmatrix}$$

c)

$$\begin{bmatrix} 0 & 1 & 2 \\ -2 & 6 & 0 \end{bmatrix}$$

d)

$$\begin{bmatrix} 0 & -1 \\ 1 & 3 \\ 4 & 0 \end{bmatrix}$$

(xi)

If the co-ordinate of two points A and B are (1,0,5) and (-1,5,2) respectively then

Identify the value of $\vec{AB} =$

a) $5i + 7k$

b) $-2i + 5j - k$

c) $3i + 2j - k$

d) $-2i + 5j - 3k$

(xii)

Select the correct value for logarithm of 1728 to the base $2\sqrt{3}$

5. Evaluate $\frac{dy}{dx}$ when $y = \sqrt{\frac{\sec x - \tan x}{\sec x + \tan x}}$. (3)

OR

Evaluate the limit : $\lim_{x \rightarrow 1} \frac{x^2 - 1}{\sqrt{5x-1} - \sqrt{3x+1}}$. (3)

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6. Write the value of $\frac{dy}{dx}$ if $y = \tan^{-1} \sqrt{\frac{1-x}{1+x}}$. (3)

OR

Let $f(x) = \frac{x^2 - 1}{x^3 - 1}$, $x \neq 1$. Write the value of $f(x)$ at $x=1$ such that $f(x)$ be continuous at $x=1$? (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. If vectors \vec{a}, \vec{b} and \vec{c} are such that $\vec{a} + \vec{b} + \vec{c} = 0$, $|\vec{a}| = 3$, $|\vec{b}| = 5$ and $|\vec{c}| = 7$ tell the angle between \vec{a}, \vec{b} . (5)

OR

Visualize the equation of straight line which passes through the point $(1, -2)$ and cuts off equal intercepts from axes? (5)

8. If $\frac{\log x}{ry - qz} = \frac{\log y}{pz - rx} = \frac{\log z}{qx - py}$ show that $x^p y^q z^r = 1$. (5)

OR

Show that
$$\begin{vmatrix} 1+a & 1 & 1 & 1 \\ 1 & 1+b & 1 & 1 \\ 1 & 1 & 1+c & 1 \\ 1 & 1 & 1 & 1+d \end{vmatrix} = abcd \left(1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d} \right)$$
 (5)

9.

(5)

If $\sin^4 \theta + \sin^2 \theta = 1$ establish that $\tan^2 \theta - \tan^4 \theta + 1 = 0$.

OR

(5)

Establish that $\sqrt{\frac{\operatorname{cosec} x + 1}{\operatorname{cosec} x - 1}} = \frac{\cos x}{1 - \sin x}$.

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(5)

10. $f(x) = \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}$

Let

Analyze that $f(x)$ is continuous at $x=0$ but not derivable at that point.

OR

Find, from definition, evaluate the derivative of $\log 2x$

(5)

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

(5)

OR

Evaluate $\frac{dy}{dx}$ if $y = x^2 \sqrt{\frac{x^2 - x + 1}{x^2 + x + 1}}$

(5)

12. Evaluate the value of k , so that the function f defined below is continuous at $x=0$, where

$$f(x) = \begin{cases} \frac{\sqrt{1+kx} - \sqrt{1-kx}}{x}, & -1 \leq x < 0 \\ \frac{2x+1}{x-1}, & 0 \leq x < 1 \end{cases}$$

OR

Evaluate the value of K for which the function $f(x) = \begin{cases} Kx^2 + 2x, & x < 2 \\ Kx^3, & x \geq 2 \end{cases}$ is

(5)

continuous at $x=2$.
