BRAINWARE UNIVERSITY

Term End Examination 2018 - 19

Programme – Dip. CSE/ Dip. ECE/ Dip. EE

Course Name - Mathematics-I

Course Code - DMAT010101

(Semester – 1)

Time allotted: 3 Hours **Full Marks : 70**

[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 Questions) 10 x 1 = 10

1. ***Choose the correct alternative from the following:***

(i) If $\log_2^3 = a$,then the value $\log_8^{27}$ is

a. a b. a^2

c. $\frac{1}{a}$ d. $\frac{1}{a^2}$

(ii) The conjugate of the complex number $\frac{1+i}{1-i}$ is

a. i b. -i

c. 1-i d. 1+i

(iii) Which line is Parallel to $y = x - 2$?

a. $y = 2x + 1$ b. $2y = 2x - 6$

c. $2y = x + 7$ d. $y = 3x + 1$

(iv) The value of $\lim_{x \to 0} \frac{\sin \frac{x}{3}}{x}$ is

a. $-\frac{1}{3}$ b. $\frac{1}{3}$

c. 3 d. –3

(v) The value of the determinant $\begin{vmatrix} 1 & 2 & -1 \\ 2 & 1 & 1 \\ 1 & 4 & 2 \end{vmatrix}$ is

a. -15 b. 15

c. 10 d. 13

(vi) The scalar or dot product of vectors $\hat{i}+2\hat{j}-3\hat{k}$ and $2\hat{i}-\hat{j}+\hat{k}$ is

a. 3 b. 2

c. -3 d. -2

(vii) If $y=\tan^{-1}\dfrac{\sin x}{1+\cos x}$ then $\dfrac{dy}{dx}=$

a. $-\dfrac{1}{2}$ b. $\dfrac{1}{2}$

c. 2 d. 1

(viii) If $\sec\theta=\dfrac{9}{2}$, where θ is in the 4^{th} quadrant, the value of $\tan\theta$ is

e. $-\sqrt{77}$ f. $-\dfrac{9}{2}$

g. $-\dfrac{\sqrt{77}}{2}$ h. $-\dfrac{\sqrt{77}}{9}$

(ix) P is the point $(4,-2)$ and Q is the point $(-3,-5)$. Then the length of PQ is

e. $\sqrt{50}$ f. $\sqrt{98}$

g. $\sqrt{40}$ h. $\sqrt{58}$

(x) If $f(x)=x^3, g(x)=\tan x$, then the value of $(fog)(x)$ is

e. $\tan(x^3)$ f. $x^3\tan x$

g. $(x\tan x)^3$ h. $(\tan x)^3$

Group – B

(Short Answer Type Questions) 3 x 5 = 15

Answer any *three* from the following :

2. If $\frac{\log x}{ry-qz}=\frac{\log y}{pz-rx}=\frac{\log z}{qx-py}$, then prove that $x^p y^q z^r = 1$. 5

3. If α be the root of the equation $ax^2+bx+c=0$, prove that $m\alpha\,(m\neq 0)$ is a root of the equation $ax^2+bmx+cm^2=0$. 5

4. Express the matrix $A=\begin{pmatrix}1 & 3 & 4\\ 7 & 2 & 6\\ 2 & 8 & 1\end{pmatrix}$ as P+Q , where P is a symmetric matrix and Q is a skew symmetric matrix. 5

5. If $\sin 2\theta = \frac{4}{5}$ find the value of $\tan\theta$ where $0\le\theta\le\frac{\pi}{4}$. 5

6. The co-ordinates of the center of a circle are $(2,-3)$ and it passes through the point $(5,-1)$. Find the equation of the circle. 5

Group – C

(Long Answer Type Questions) 3 x 15 = 45

Answer any *three* from the following :			
7.	(a)	If the roots of the equation $ax^2+4bx+2a=0$ are imaginary , prove that the roots of $(a+b)x^2+2bx+(a-b)=0$ are also imaginary .	5
	(b)	If $A=\begin{pmatrix}1 & 2 & 2\\ 2 & 1 & 2\\ 2 & 2 & 1\end{pmatrix}$, show that $A^2-4A-5I_3=O$.	5
	(c)	Express the equation $2x-3y+4=0$ in normal form. Hence obtain the perpendicular distance of origin from this line.	5
8.	(a)	If $f(x)=2x^2-3x-1$, find $f(x+1)$. Hence find $f(0)$.	5
	(b)	Find the area of the quadrilateral whose vertices are $(-3,-2),(5,-4),(1,5)$ and $(-1,2)$	5
	(c)	Find $\frac{dy}{dx}$ where $y=\tan^{-1}\sqrt{\frac{1+\cos 2x}{1-\cos 2x}}$.	5

9.	(a)	Prove that a square matrix can be expressed as the sum of a symmetric matrix and a skew symmetric matrix.	5
	(b)	If the sum of the roots of $ax^2+bx+c=0$ be equal to sum of their squares then prove that $2ac=ab+b^2$.	5
	(c)	Find whether the three straight lines $2x+3y=6, 8x+7y=26$ and $x-y+4=0$ are concurrent or not.	5
10.	(a)	If $A=\begin{pmatrix}1 & 0 & 1\\ 3 & 4 & 5\\ 2 & 3 & 4\end{pmatrix}$, find A^{-1}.	5
	(b)	Test the continuity of the function at x=2 , $f(x)=\begin{cases}\dfrac{x^3-8}{x^2-4}, & x\neq 2\\ 3, & x=2\end{cases}$	5
	(c)	If $z=x+iy$ and $\lvert z+6\rvert=\lvert 2z+3\rvert$, prove that $x^2+y^2=9$.	5
11.	(a)	Solve the following system of equations by Cramer's rule : $x+2y-3z=1$, $2x-y+z=4$, $x+3y=5$	5
	(b)	Show that the vectors $\hat{i}-3\hat{j}+5\hat{k}$, $3\hat{i}-2\hat{j}+\hat{k}$ and $2\hat{i}+\hat{j}-4\hat{k}$ form a right-angled triangle.	5
	(c)	Evaluate $\lim\limits_{x\to 2}\dfrac{x^2-4}{\sqrt{3x-2}-\sqrt{x+2}}$.	5
