12MATHEMATICS

PREVIOUSYEARPUBLICQUESTIONS2-MARKS

S.NO	2 MARK QUESTIONS	YEAR
C1.1	Provethat $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ isorthogonal.	Mar-2023
1.2	If $adj(A)=\begin{bmatrix} 0 & -2 & 0 \\ 6 & 2 & -6 \\ -3 & 0 & 6 \end{bmatrix}$ find A^{-1}	Jun-2023
C2.1	Provethat $\left(\frac{1+i}{1-i}\right)^3-\left(\frac{1-i}{1+i}\right)^3=2i$	Mar-2020
2.2	If $(1+i)(1+2i)\ldots\ldots(1+ni)=x+iy$ then provethat $2.5.10\ldots\ldots(1+n^2)=x^2+y^2$	Mar-2020
2.3	Findtheleastpositiveintegernsuchthat $\left(\frac{1+i}{1-i}\right)^n=1$	Sep-2020
2.4	ObtaintheCartesianformofthelocusof $z=x+iy$ in $\|z+i\|=\|z-i\|$	Sep-2020
2.5	If $z=(2+3i)(1-i)$ thenprovethat $z^{-1}=\frac{5}{26}-i\frac{1}{26}$	Mar-2021
2.6	Prove the followingproperties: $Re(z)=\frac{z+\bar{z}}{2}$ and $Im(z)=\frac{z-\bar{z}}{2i}$	Mar-2022
2.7	If $z_1=3, z_2=-7i$ and $z_3=5+4i$, showthat $z_1(z_2+z_3)=z_1z_2+z_1z_3$.	Jul-2022
2.8	If $\|z\|=2$, showthat $3\leq\|z+3+4i\|\leq 7$	Mar-2023
2.9	Express $e^{\cos\theta+i\sin\theta}$ in $a+ib$ form.	Mar-2023
2.10	FindtheprincipalargumentArg(z)when $z=\frac{-2}{1+i\sqrt{3}}$	Jun-2023
C3.1	If α,β,γ and δ aretherootsofthepolynomialequation $2x^4+5x^3-7x^2+8=0$ findaquadraticequationwithintegercoefficientswhoserootsare $\alpha+\beta+\gamma+\delta$ and $\alpha\beta\gamma\delta$.	Sep-2020
3.2	If α and β arerootsof $x^2-5x+6=0$ then provethat $\alpha^2-\beta^2=\pm 5$	Mar-2021
3.3	Findthepolynomialequationofminimumdegreewithrationalcoefficients,having $2-\sqrt{3}$ as a root.	Mar-2022
3.4	If α and β arerootsof $x^2+5x+6=0$ then provethat $\alpha^2+\beta^2=13$	Jul-2022

3.5	If p and q are the roots of the equation $lx^2+nx+n=0$, show that $\sqrt{\frac{p}{q}}+\sqrt{\frac{q}{p}}+\sqrt{\frac{n}{l}}=0$.	**Mar-2023**
C4.1	Find the value of $\sin^{-1}\left(\sin\frac{5\pi}{4}\right)$	**Mar-2020**
4.2	Find the principal value of $tan^{-1}(\sqrt{3})$	**Sep-2020** **Mar-2022**
4.3	For what value of x does $sinx=sin^{-1}x$?	**Mar-2021**
4.4	Find the value of $\sin^{-1}(1)+\cos^{-1}(1)$	**Jul-2022**
C5.1	Find the equation of the parabola if the curve is open leftward, vertex is $(2,1)$ and passing through the point $(1,3)$	**Mar-2020**
5.2	If $y=4x+c$ is a tangent to the circle $x^2+y^2=9$, find c.	**Mar-2023**
5.3	Find the equation of the hyperbola with vertices $(0,\pm4)$ and foci $(0,\pm6)$	**Jun-2023**
C6.1	Find the magnitude and the direction cosines of the torque about the point (2,0,-1) of a force $2\hat{\imath}+\hat{\jmath}-\hat{k}$ whose line of action passes through the origin.	**Mar-2020**
6.2	If $\hat{a},\hat{b},\hat{c}$ are three unit vectors such that $\hat{b}$ and $\hat{c}$ are non-parallel and $\hat{a}\times(\hat{b}\times\hat{c})=\frac{1}{2}\hat{b}$, find the angle between $\hat{a}$ and $\hat{c}$.	**Sep-2020**
6.3	Show that the three vectors $2\hat{\imath}+3\hat{\jmath}+\hat{k}$, $\hat{\imath}-2\hat{\jmath}+2\hat{k}$ and $3\hat{\imath}+\hat{\jmath}+3\hat{k}$ are coplanar	**Mar-2021**
6.4	Show that the distance from the origin to the plane $3x+6y+2z+7=0$ is 1	**Mar-2022**
6.5	Find the acute angle between the two straight lines. $\frac{x-4}{2}=\frac{y}{1}=\frac{z+1}{-2}$ and $\frac{x-1}{4}=\frac{y+1}{-4}=\frac{z-2}{2}$	**Jul-2022**
6.6	Find the vector equation of a plane which is at a distance of 7 units from the origin having 3, -4, 5 as direction ratios of a normal to it.	**Mar-2023**
6.7	Find the distance from a point $(2,5,-3)$ to the plane $\vec{r}\cdot(6\hat{\imath}-3\hat{\jmath}+2\hat{k})=5$	**Jun-2023**

C7.1	Find the value in the interval $(\frac{1}{2},2)$ satisfied by the Rolle's theorem for the function $f(x)=x+\frac{1}{x}, x\in[\frac{1}{2},2]$	Mar-2020
7.2	Evaluate the limit: $\lim_{x\to 0}\left(\frac{\sin mx}{x}\right)$	Sep-2020
7.3	Prove that $\lim_{x\to\infty}\left(\frac{e^x}{x^m}\right)$, where m is a positive integer is ∞	Mar-2021
7.4	Find the points on the curve $y = x^3 - 3x^2 + x - 2$ at which the tangent is parallel to the line $y = x$.	Mar-2022
7.5	Find the tangent to the curve $y=x^2-x^4$ at $(1,0)$	Jul-2022
7.6	Find the equation of tangent to the curve $y=x^2+3x-2$ at the point $(1,2)$.	Mar-2023
7.7	Prove that the function f(x)=x^2-2x-3 is strictly increasing in $(2,\infty)$	Jun-2023
C8.1	For the function $f(x)=x^2+3x$, calculate the differential df when $x=2$ and $dx=0.1$	Mar-2020 Mar-2022
8.2	Show that if $x=r\cos\theta, y=r\sin\theta$, then $\frac{\partial r}{\partial x}$ is equal to $\cos\theta$	Sep-2020
8.3	If $g(x)=x^2+\sin x$, then find dg.	Mar-2021
8.4	Find df for $f(x)=x^2+3x$ and evaluate it for $x=3$ and $dx=0.02$.	Jul-2022
8.5	If the radius of a sphere with radius 10cm, has to decrease by 0.1cm, approximately how much will its volume decrease?	Mar-2023
8.6	Show that the percentage error in the n^{th} root of a number is approximately $\frac{1}{n}$ times the percentage error in the number.	Jun-2023
C9.1	Prove that: $\int_0^{\pi/2}\frac{f(\sin x)}{f(\sin x)+f(\cos x)}dx=\frac{\pi}{4}$	Mar-2020
9.2	Evaluate $\int_3^4\frac{dx}{x^2-4}$	Sep-2020
9.3	Evaluate: $\int_b^\infty\frac{1}{a^2+x^2}dx, a>0, b\in R$	Mar-2023

9.4	Evaluate: $\int_0^{\infty} x^5 e^{-3x} dx$	**Jun-2023**
C10.1	Findthedifferentialequationofthefamilyofparabolas $y^2 = 4ax$,where"a"isan arbitrary constant.	**Mar-2020**
10.2	Findthedifferentialequationofthefamilyof $y = ax^2 + bx + c$ wherea,bare parameters and c is a constant.	**Sep-2020**
10.3	Showthatthesolution of $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$ is$sin^{-1}y=sin^{-1}x+C$ or$sin^{-1}x=sin^{-1}y+C$	**Mar-2021** **Mar-2022**
10.4	Showthatthedifferentialequationcorrespondingto$y = Asinx$,whereAisan arbitrary constant, is $y = y'tanx$	**Mar-2021**
10.5	Showthatthedifferential equationofthefamilyofcurves$y=Ae^x+ Be^{-x}$, whereA andBarearbitraryconstants,is $\frac{d^2y}{dx^2} - y = 0$.	**Mar-2022**
10.6	Showthat$y=ae^x+be^{-x}$,isasolutionofthedifferentialequation$y''-y= 0$.	**Jul-2022**
10.7	Formthedifferentialequationofthecurve$y = ax^2 + bx + c$ wherea,bandc arbitrary constants.	**Jul-2022**
10.8	Assumethatasphericalraindropevaporatesatarateproportionaltoitssurfacearea. Formadifferentialequationinvolvingtherateofchangeoftheradiusoftheraindrop.	**Jun-2023**
C11.1	IfXistherandomvariablewithdistributionfunctionF(x)givenby $F(x)=\begin{cases} 0 & ;-\infty<x<0 \\ \frac{1}{2}(x^2+x) & ;0\le x<1 \\ 1 & ;1\le x<\infty \end{cases}$ Thenprovethatthep.d.f.is$f(x)=\begin{cases} \frac{1}{2}(2x+1) & ;0\le x<1 \\ 0 & ;otherwise \end{cases}$	**Mar-2021**
11.2	TheprobabilitydensityfunctionofXisgivenby $f(x)=\begin{cases} kxe^{-2x} & for x>0 \\ 0 & for x\le 0 \end{cases}$ Provethatthevalueofkis4.	**Mar-2021**
11.3	ArandomvariableXhasthefollowingprobabilitymassfunction Findk.	**Mar-2022**
11.4	Xisthenumberoftailsoccurredwhenthreefaircoinsaretossedsimultaneously.Find the values of the random variable X and number of points in its reverse images.	**Mar-2022**

<table>
<tr><td>11.5</td><td>ArandomvariableXhasthefollowingprobabilitymassfunction
<table><tr><td>X</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr><tr><td>f(x)</td><td>k^2</td><td>$2k^2$</td><td>$3k^2$</td><td>2k</td><td>3k</td></tr></table>Showthatthevalueofkis $\frac{1}{6}$</td><td>Jul-2022</td></tr>
<tr><td>11.6</td><td>Supposetheamountofmilksolddailyatamilkboothisdistributedwithaminimum of 200 liters and a maximum of 600 liters with probability density function of X is:
$f(x)=\begin{cases} k; 200\le x\le 600 \\ 0; otherwise \end{cases}$
Findthevalueofk.</td><td>Jul-2022</td></tr>
<tr><td>11.7</td><td>Apairoffairdiceisrolledonce.Findtheprobabilitymassfunctiontogetthenumber of four.</td><td>Jun-2023</td></tr>
<tr><td>C12.1</td><td>ProvethatIdentityelementisUniqueifitexists.</td><td>Mar-2020</td></tr>
<tr><td>12.2</td><td>Examinethebinaryoperationoftheoperation$a*b=\left(\frac{a-1}{b-1}\right); \forall a,b\in Q$</td><td>Sep-2020</td></tr>
<tr><td>12.3</td><td>Let$A=\begin{pmatrix}0 & 1\\ 1 & 1\end{pmatrix}; B=\begin{pmatrix}1 & 1\\ 0 & 1\end{pmatrix}$be anytwo Booleanmatricesofthesame type.Find
$A\vee B$and$A\wedge B$</td><td>Mar-2023
Jun-2023</td></tr>
</table>

X	1	2	3	4	5	6
f(x)	k	2k	6k	5k	6k	10k