12MATHEMATICS

PREVIOUSYEARPUBLICQUESTIONS5-MARKS

S.NO.	3 MARK QUESTIONS	YEAR
C1.1	Testforconsistencyandifpossible,solvethesystemofequationsbyrankmethod $x-y+z=-9;2x-y+z=4;3x-y+z=6;4x-y+2z=7$.	Mar-2020
1.2	Testtheconsistencyandifpossible,solvethefollowingsystemofequationsbyrank method.$2x+2y+z=5$; $x-y+z=1$; $3x+y+2z=4$	Sep-2020
1.3	Solvethe systemof equations$x-y+2z=2,2x+y+4z=7,4x-y+z=4$ byCramer'srule	Mar-2021
1.4	Cramer'sruleisnotapplicabletosolvethesystem $3x+y+z=2,x-3y+2z=1,7x-y+4z=5$why?	Mar-2022
1.5	SolvethesystemofequationsbyCramer'sRule: $3x+3y-z=11$,$2x-y+2z=9,4x+3y+2z=25$.	Jul-2022
1.6	A boy$y=ax^2+bx+c$through the points (-6, 8), (-2, -12) and (3, 8). He wants to meet his friend at P(7, 60). Will he meet his friend? (Use Gaussian Elimination method)	Mar-2023
1.7	Solvethesystemoflinearequationsby Cramer'sRule. $x_1-x_2=3$,$2x_1+3x_2+4x_3=17,x_2+2x_3=7$	Jun-2023
C2.1	If$2\cos\alpha=x+\frac{1}{x},2\cos\beta=y+\frac{1}{y}$ show that $i)\ \frac{x^m}{y^n}-\frac{y^n}{x^m}=2i\sin(m\alpha-n\beta)$ $ii)x^my^n+\frac{1}{x^my^n}=2\cos(m\alpha+n\beta)$	Mar-2020
2.2	Provethat$arg(z_1z_2)=arg(z_1)+arg(z_2)$	Sep-2020
2.3	Ifz=x+iyisacomplexnumbersuchthat $\left\|\frac{z-4i}{z+4i}\right\|=1$, showthatthelocusofz isreal axisory$=0$	Mar-2021
2.4	Showthatthe locusof$z=x+iy$if$\|z+i\|=\|z-1\|$,is$x+y=0$.	Mar-2022
2.5	Showthat $\left(2+i\sqrt{3}\right)^{10}-\left(2-\sqrt{3}\right)^{10}$ ispurelyimaginary.	Jul-2022
2.6	Solve theequation $z^3+8i=0$, where$z\in C$.	Mar-2023
2.7	Ifz=x+iyand$\arg\left(\frac{z-i}{z+2}\right)=\frac{\pi}{4}$,showthat$x^2+y^2+3x-3y+2=0$.	Jun-2023
C3.1	Solvetheequations$6x^4-5x^3-38x^2-5x+6=0$ifitisknownthat$\frac{1}{3}$isasolution	Mar-2023

3.2	Solvetheequation$2x^3+11x^2-9x-18=0$	**Jun-2023**
C4.1	Drawthegraph of$Cosx$in$[0,\pi]$and $cos^{-1}x$in$[-1,1]$	**Mar-2020**
4.2	Draw thegraphoftan$x$in $[\frac{-\pi}{2},\frac{\pi}{2}]andtan^{-1}xin[-\infty,\infty]$	**Sep-2020**
4.3	Provethat$cos^{-1}[cos(\frac{4\pi}{3})]+cos^{-1}[cos^{5\pi}]=\frac{17\pi}{12}$.	**Mar-2021**
4.4	Findthevalueof$cot^{-1}(1)+sin^{-1}(-\frac{\sqrt{3}}{2})-sec^{-1}(-\sqrt{2})$	**Mar-2022**
4.5	Showthatthevalueof$sin^{-1}(sin^{5\pi}\frac{cos^{\pi}}{9}+cos^{5\pi}\frac{sin^{\pi}}{9})is\frac{\pi}{3}$.	**Jul-2022**
4.6	If$\cos^{-1}x+\cos^{-1}y+\cos^{-1}z=\pi;0<x,y,z<1$showthat$x^2+y^2+z^2+2xyz=1$	**Mar-2023**
4.7	Solve:$\tan^{-1}\left(\frac{x-1}{x-2}\right)+\tan^{-1}\left(\frac{x+1}{x+2}\right)=\frac{\pi}{4}$	**Jun-2023**
C5.1	Findtheequationofthecirclepassingthroughthepoints $(1,1),(2,-1)$and$(3,2)$	**Mar-2020**
5.2	Assumethatwaterissuingfromtheendofahorizontalpipe, 7.5$m$abovetheground, describes a parabolic path. The vertex of the parabolic path is at the end of the pipe. Ataposition 25. $m$belowthe lineofthepipe, the flo vof waterhascurved outward 3m beyond the verticalline through theendofthe pipe. How farbeyond this vertical line will the water strike the ground?	**Mar-2020**
5.3	Findthecenter,foci,andeccentricityofthehyperbola$11x^2-25y^2-44x+50y-256=0$.	**Sep-2020**
5.4	Arodoflength1.2mmoveswithitsendsalwaystouchingtheco-ordinateaxes.Thelocusofa point P on the rod, which is 0.3 m from the end in contact with x-axis is an ellipse. Find the eccentricity.	**Sep-2020**
5.5	Showthattheequationoftheparabolawithfocus$(-\sqrt{2},0)$anddirectrix $x=\sqrt{2}$is$y^2=-4\sqrt{2}x$.	**Mar-2022**
5.6	Themaximumandminimumdistancesoftheearthfromthesunrespectively are 152×10^6kmand94.2×10^6km.TheSunisatonefocusoftheellipticalorbit.Showthat thedistancefromthesunotheotherfocusis575×10^5km.	**Mar-2022**
5.7	Theparaboliccommunicationantennahasafocusat2mtsdistancefromthevertexofthe antenna. Show that the width of the antenna 3 mts from the vertex is $4\sqrt{6}$ mts.	**Jul-2022**
5.8	Findtheeccentricity,foci,vertices,andcenterfortheellipse $\frac{x^2}{25}+\frac{y^2}{9}=1$anddrawthe roughdiagram.	**Jul-2022**
5.9	Identifythetypeofconicandfindcenter,fociandverticesof $18x^2+12y^2-144x+48y+120=0$	**Mar-2023**
5.10	Findtheequationofthecirclepassingthroughthepoints $(1,0),(-1,0)$and$(0,1)$	**Jun-2023**

C6.1	Provebyvector methodthat$\cos(\alpha+\beta)=\cos\alpha\cos\beta-sin\alpha\sin\beta$	**Mar-2020**
6.2	Findthenon-parametricformofvectorequationandCartesianequationoftheplane passing through the point (0,1,-5) –and parallel to the straight lines $\vec{r}=(\hat{\imath}+2\hat{\jmath}-4\hat{k})+s(2\hat{\imath}+3\hat{\jmath}+6\hat{k})and\vec{r}=(\hat{\imath}-3\hat{\jmath}+5\hat{k})+t(\hat{\imath}+\hat{\jmath}-\hat{k})$	**Mar-2020**
6.3	Provebyvector methodthat$\cos(\alpha-\beta)=\cos\alpha\cos\beta+sin\alpha\sin\beta$ Provebyvector methodthat$\cos(A-B)=\cos A\cos B+sinA\sin B$	**Sep-2020** **Mar-2023** **Jul-2022**
6.4	Find the non-parametric form of vector equation of the plane passing through the point(1,-2,4)andperpendiculartotheplane $x+2y-3z=11$andparalleltothe line $\frac{x+7}{3}=\frac{y+3}{-1}=\frac{z}{1}$	**Sep-2020**
6.5	Provebyvector methodthat$\sin(A+B)=\sin A\cos B+cosAsinB$	**Mar-2022**
6.6	Find the vector equation (any form), or Cartesian equations of the plane passing throughthepoints(2,2,1),(9,3,6)andperpendiculartotheplane $2x+6y+6z=9$.	**Mar-2022**
6.7	Showthatthecartesianequationoftheplanepassingthroughthepoints (a,0,0),(0, b,0),(0,0, c)is $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$.	**Jul-2022**
6.8	FindtheparametricformofVectorequationandCartesianequationsoftheplane containing the line $\vec{r}=(\hat{\imath}-\hat{\jmath}+3\hat{k})+t(2\hat{\imath}-\hat{\jmath}+4\hat{k})$ andperpendicularto the plane $\vec{r}\cdot(\hat{\imath}+2\hat{\jmath}+\hat{k})=8$	**Mar-2023**
6.9	If $\vec{a}=2\hat{\imath}+3\hat{\jmath}-\hat{k}, \vec{b}=3\hat{\imath}+5\hat{\jmath}+2\hat{k}, \vec{c}=-\hat{\imath}-2\hat{\jmath}+3\hat{k}$ thenverify that $(\vec{a}\times\vec{b})\times\vec{c}=(\vec{a}\cdot\vec{c})\vec{b}-(\vec{b}\cdot\vec{c})\vec{a}$	**Jun-2023**
6.10	Findtheequationofthecirclepassingthroughthepoints(1,0),(-1,0)and(0,1).	**Jun-2023**
6.11	Findthefootoftheperpendiculardrawnfromthepoint(5,4,2)totheline $\frac{x+1}{2}=\frac{y-3}{3}=\frac{z-1}{-1}$. Alsofindthe equationoftheperpendicular.	**Jun-2023**
C7.1	A police jeep, approaching an orthogonal intersection from the northern direction, is chasing a speedingcar that has turned and moving straight east. When thejeep is 0.6 kmnorthoftheintersectionandcaris0.8kmtotheeast.Thepolicedeterminewitha radarthatthedistancebetweenthemandthecarisincreasingat20km/hr.Ifthejeep is moving at 60 km/hr at the instant of measurement, what is the speed of the car?	**Mar-2020**

7.2	A square shaped thin material with area 196 sq. units to make into an open box by cuttingsmallequalsquaresfromthefourcornersandfoldingthesidesupward.Prove thatthelengthofthesideofaremovedsquare is $\frac{7}{3}$ whenthevolumeoftheboxis maximum.	**Mar-2020**
7.3	Provethatamongalltherectanglesofthegivenperimeter,thesquarehasthe maximum area.	**Sep-2020 Jul-2022**
7.4	CarAistravellingfromwestat50km/hr.andCarBistravellingtowardsnorthat60 km/hr.Both areheadedfor the intersectionofthetwo roads.Atwhatrate are the Carsapproachingeachotherwhen CarAis0.3kilometersandCarBiskilometersfrom the intersection?	**Sep-2020**
7.5	A camera is accidently knocked off an edge of a cliff 400 ft. high. The camera falls a distanceof$s = -16t^2$intseconds.Showthatthecamerahitsthegroundwhent=5 seconds and also prove that the velocity when it hits the ground is -160 ft. /sec.	**Mar-2021**
7.6	Provethatthe localminimumvaluesforthefunction$f(x) = 4x^6 - 6x^4$ Attainat-1and1.	**Mar-2022**
7.7	Showthat theangelbetween thecurves$y=x^2$and$x=y^2$at(1,1)is$tan^{-1}3$. Θ 4	**Mar-2022**
7.8	Aparticleisfiredstraightupfromthegroundtoreachaheightofsfeetintseconds where$s(t)=128t-16t^2$.(i)Computethemaximumheightoftheparticlereached. (ii)whatisthevelocitywhentheparticlehitstheground?	**Jul-2022**
7.9	Prove that the ellipse$x^2+4y^2=8$and the hyperbola$x^2-2y^2=4$intersect orthogonally.	**Mar-2023**
7.10	Findthemaximumvalue of $\frac{\log x}{x}$	**Mar-2023**
7.11	Evaluate:$\lim_{x\to\frac{\pi}{2}}(\sin x)^{\tan x}$	**Jun-2023**
7.12	Aparticlemovesalongalineaccordingtothelaw$s(t)=2t^3-9t^2+12t-4$where$t\geq 0$ i)Atwhattimestheparticlechangesdirection?ii)Findthetotal distancetravelledby the particle in the first 4 seconds. iii) Find the particle's acceleration each time the velocity is zero.	**Jun-2023**
C8.1	If$u=\sin^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$,showthat$x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\frac{1}{2}\tan u$	**Jun-2023**

C9.1	Evaluate: $\int_{-\pi}^{\pi} \frac{\cos^2 x}{1+a^x} dx$	**Mar-2020**
9.2	Show that $\int_0^1 \left(\tan^{-1}x + \tan^{-1}(1-x)\right) dx = \frac{\pi}{2} - \log 2$	**Sep-2020**
9.2	Find the area of the region bounded by x-axis, the curve $y = \lvert \cos x \rvert$, the lines $x = 0$ and $x = \pi$	**Mar-2020**
9.3	Show that $\int_0^a \frac{f(x)}{f(x)+f(a-x)} dx = \frac{a}{2}$	**Mar-2022**
9.3	Find the area of the region bounded by the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ and its latus rectums	**Sep-2020**
9.4	Show that $\int_0^1 \sqrt{\frac{1-x}{1+x}} dx = \frac{\pi}{2} - 1$	**Mar-2021**
9.5	Show that the area of the region bounded by $3x - 2y + 6 = 0$, $x = -3$, $x = 1$ and x-axis, is $\frac{15}{2}$.	**Mar-2022**
9.6	Find the area of the region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ using integration.	**Jul-2022**
9.7	Show that the area between the parabola $y^2 = 16x$ and its latus rectum (using integration) is $\frac{128}{3}$.	**Jul-2022**
9.8	Find the area of the region common to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the straight line $\frac{x}{a} + \frac{y}{b} = 1$.	**Mar-2023**
9.9	Find by integration the area of the region bounded by the lines $5x - 2y = 15$, $x + y + 4 = 0$ and the x-axis.	**Jun-2023**
C10.1	If F is the constant force generated by motor of an automobile of mass M, its velocity V is given by $M\frac{dV}{dt} = F - kV$, where k is a constant. Prove that $V = \frac{F}{k}(1 - e^{M})^{\frac{-kt}{}}$ when $t = 0$ and $V = 0$	**Mar-2020**

10.2	In a murder investigation, a corpse was found by detective at exactly 8 p.m. Being alert, the detectivealsomeasuredthebodytemperatureandfounditto be $70^{\circ}F$.Twohourslater,the detective measured the body temperature again and found it to be $60^{\circ}F$.If the room temperatureis $50^{\circ}F$andassumingthatthebodytemperatureofthepersonbeforedeath was $98.6^{\circ}F$, prove that the time of death is 5,26 p.m. (5hrs 26 minutes app.) $[\frac{\log(2,43)}{\log(2)} \simeq 1.28]$	**Mar-2020**
10.3	Apotofboilingwaterat $100^{\circ}C$isremovedfromastoveattime t=0andlefttocoolinthe kitchen. After 5 minutes, the water temperature has decreased to $80^{\circ}C$, and another 5minuteslaterithasdroppedto $65^{\circ}C$.Determinethetemperatureofthekitchen.	**Sep-2020**
10.4	Solve $\frac{dy}{dx} = e^{x+y} + x^3 e^y$	**Sep-2020**
10.5	Show thatthesolution ofthe differentialequation $(1+x^2)\frac{dy}{dx} = 1+y^2$ is $tan^{-1}y = tan^{-1}x + C$ or $tan^{-1}x = tan^{-1}y + C$ **Solve :** $(1+x^2)\frac{dy}{dx} = 1+y^2$	**Mar-2022** **Jun-2023**
10.6	Solvethedifferentialequation $\frac{dy}{dx} + \frac{y}{x} = sinx$.	**Jul-2022**
10.7	Solve: $(1+x+xy^2)\frac{dy}{dx} + (y+y^2) = 0$	**Mar-2023**
10.8	Suppose a person deposits ₹ 10,000 in a bank account at the rate of 5% per annum compoundedcontinuously.Howmuchmoneywillbeinhisbankaccount18months later?	**Mar-2023**
C11.1	Threefaircoinsaretossedonce.Findtheprobabilitymassfunction,meanandvariancefor number of heads occurred, Verify the results by binomial distribution.	**Mar-2020**
11.2	If $X \sim B(n,p)$ suchthat P(X=4)=P(X=2)andn=6.Findthedistribution,meanand standard deviation.	**Sep-2020**
11.3	Thedistribution functionofacontinuousrandomvariable X is: $F(x) = \begin{cases} 0 & ;x<1 \\ x-1 & ;1 \le x \le 5 \\ \frac{\quad}{4} & \\ 1 & ;x>5 \end{cases}$ find(i)P(X<3)(ii)$P(2<x<4)$(iii)$P(3 \le X)$	**Mar-2022**

11.4	Thecumulativedistributionfunctionofadiscreterandomvariableisgivenby: $F(x)=\begin{cases}0 & ;-\infty<x<0\\ 1/2 & ;0\le x<1\\ 3/5 & ;1\le x<2\\ 4/5 & ;2\le x<3\\ 9/10 & ;3\le x<4\\ 1 & ;4\le x<\infty\end{cases}$ Alsofind(i)Theprobabilitymassfunction (ii)$P(X<3)$and(ii)$P(X\ge 2)$	**Jul-2022**
11.5	Suppose the amount of milk sold daily at a milk booth is distributed with a minimum of200litersandamaximumof600literswithprobabilitydensityfunctionofrandom variable X is $f(x)=\begin{cases}k, 200\le x\le 600\\ 0, otherwise\end{cases}$ Find(i)thevalueofk(ii)thedistributionfunction(iii)theprobability,thatdailysales will fall between 300 liters and 500 liters.	**Mar-2023**
11.6	Themeanandvarianceofabinomialvariate Xarerespectively2and1.5. Find$(i)P(X=0)(ii)P(X=1)(iii)P(X\ge 1)$	**Jun-2023**
C12.1	Prove$p\to(q\to r)\equiv(p\wedge q)\to r$usingtruthtable.	**Mar-2022**
12.2	Verifywhetherthefollowingcompoundpropositionistautologyorcontradictionor contingency.$(p\to q)\leftrightarrow(\neg p\to q)$	**Jul-2022**
12.3	Provethat$p\to(\neg q\vee r)\equiv\neg p\vee(\neg q\vee r)$usingtruthtable.	**Mar-2023**
12.4	Let$M=\left\{\begin{pmatrix}x & x\\ x & x\end{pmatrix}:x\in R-\{0\}\right\}$andlet*bethematrixmultiplication. Examinetheclosure,associative,existenceofidentity,existenceofinverseforthe operation * on M.	**Jun-2023**