CODE:- AG-4-3689

पजियन क्रमांक REG.NO:-TMC -D/79/89/36

General Instructions :

1. All question are compulsory.
2. The question paper consists of 29 questions divided into three sections A,B and C. Section – A comprises of 10 question of 1 mark each. Section – B comprises of 12 questions of 4 marks each and Section – C comprises of 7 questions of 6 marks each .
3. Question numbers 1 to 10 in Section – A are multiple choice questions where you are to select one correct option out of the given four.
4. There is no overall choice. However, internal choice has been provided in 2 question of four marks and 2 questions of six marks each. You have to attempt only one lf the alternatives in all such questions.
5. Use of calculator is not permitted.
6. Please check that this question paper contains 4 printed pages.
7. Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.

सामान्य निर्देश :

1. सभी प्रश्न अनिवार्य हैं।
2. इस प्रश्न पत्र में 29 प्रश्न है, जो 3 खण्डों में अ, ब, व स है। खण्ड – अ में 10 प्रश्न हैं और प्रत्येक प्रश्न 1 अंक का है। खण्ड – ब में 12 प्रश्न हैं और प्रत्येक प्रश्न 4 अंको के हैं। खण्ड – स में 7 प्रश्न हैं और प्रत्येक प्रश्न 6 अंको का है।
3. प्रश्न संख्या 1 से 10 बहुविकल्पीय प्रश्न हैं। दिए गए चार विकल्पों में से एक सही विकल्प चुनें।
4. इसमें कोई भी सर्वोपरि विकल्प नहीं है, लेकिन आंतरिक विकल्प 2 प्रश्न 4 अंको में और 2 प्रश्न 6 अंको में दिए गए हैं। आप दिए गए विकल्पों में से एक विकल्प का चयन करें।
5. कैलकुलेटर का प्रयोग वर्जित हैं ।
6. कृपया जाँच कर लें कि इस प्रश्न–पत्र में मुद्रित पृष्ठ 4 हैं।
7. प्रश्न–पत्र में दाहिने हाथ की ओर दिए गए कोड नम्बर को छात्र उत्तर–पुस्तिका के मुख–पृष्ठ पर लिखें।

Pre-Board Examination 2010 -11

Time : 3 Hours	अधिकतम समय : 3
Maximum Marks : 100	अधिकतम अंक : 100
Total No. Of Pages :4	कुल पृष्ठों की संख्या : 4

CLASS – XII ***CBSE*** ***MATHEMATICS***

Section A

Q.1	If $A=\begin{bmatrix}1&1&1\\0&1&3\\1&K&1\end{bmatrix}$, *Find k, If Cofactor of* a_{11} *is twice the cofactor of* a_{23} Ans.K=-1
Q.2	Check the monotonocity i.e increasing & decreasing of $f(x)=\cos 2x, [\pi/2, \pi]$. Ans.increasing
Q.3	*Let* $\vec{a}=5\vec{i}-\vec{j}+7\vec{k}$,$\vec{b}=\vec{i}-\vec{j}+\lambda\vec{k}$ *Find* λ *such that* $\vec{a}+\vec{b}$ *and* $\vec{a}-\vec{b}$ *are perpendicular.* Ans. $\lambda=\pm\sqrt{73}$
Q.4	Find $(\vec{i}\times\vec{j})\bullet\vec{k}+(\vec{k}\times\vec{j})\bullet\vec{i}-(\vec{i}\times\vec{k})\bullet\vec{j}$ Ans.=1
Q.5	Find the total number of one one function from set A to A if A = {1 , 2 , 3 , 4 } . Ans. 4! = 24

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Q.6	If $\lvert \vec{a} \times \vec{b} \rvert = 4$, $\lvert \vec{a}.\vec{b} \rvert = 2$, then find $\lvert \vec{a} \rvert^2 \lvert \vec{b} \rvert^2$. Ans. =20
Q.7	Find the angle made by the vector i – 4j + 8k with the z – axis. Ans. $\theta = \cos^{-1}\left(\frac{8}{9}\right)$
Q.8	Given P(A) = 1/2, P(B) = 1/3 and P(A U B) = 2/3. Are the events A and B independent? Ans.Check $P(A \cap B) = P(A) \times P(B)$ yes
Q.9	If $\lvert A \rvert = 3$ *find the* $\lvert A^{-1} \rvert$. Ans. $= \frac{1}{3}$
Q.10	Find $\int_{-\pi}^{\pi} \left(\sin^{-93} x + x^{295}\right) dx$. Ans. =0
	Section B
Q.11	Let A = {-1, 0, 1, 2}, B = {-4, -2, 0, 2} and $f, g : A \to B$ be functions defined by $f(x) = x^2 - x$, $x \in$ A and $g(x) = 2\left\lvert x - \frac{1}{2} \right\rvert - 1$, $x \in$ A are f and g equal. Justify your answer. Ans. $f : g = \{(-1,2), (0,0), (1,0), (2,2)\}$
Q.12	Prove that the curves $y^2 = 4ax$ and $xy = c^2$ cut at right angles if $c^4 = 32a^4$ .Ans. $x = \left(\frac{c^4}{4a}\right)^{\frac{1}{3}}, y = c^2\left(\frac{4a}{c^4}\right)^{\frac{1}{3}}$ **OR** Find the equation of tangent to the curve $y = \sqrt{3x - 2}$ which is parallel to the line 4x – 2y + 5 = 0. Ans pt $\left(\frac{41}{48}, \pm\frac{3}{4}\right)$ eq $\to 48x - 24y = 23$ & $48x - 24y = 59$
Q.13	Prove that $\begin{vmatrix} a & b-c & c+b \\ a+c & b & c-a \\ a-b & b+a & c \end{vmatrix} = (a+b+c)(a^2+b^2+c^2)$.
Q.14	Evaluate : $\int_0^{\pi/2} \frac{x \sin x \cos x}{\sin^4 x + \cos^4 x} dx$. Ans.$= \frac{\pi^2}{16}$
Q.15	Show that the function $f(x) = \begin{cases} \frac{e^{\frac{1}{x}} - 1}{e^{\frac{1}{x}} + 1} & if \ x \neq 0 \\ 0 & if \ x = 0 \end{cases}$ is discontinuous at x = 0 . Ans. RHL = 1 & LHL = -1 $RHL \neq LHL$
Q.16	Form the differential equation of the family of circles having radii 3 .Ans. $\left\{\frac{1 + \left(\frac{dy}{dx}\right)^2}{\frac{d^2y}{dx^2}}\right\}^2 \left[\left(\frac{dy}{dx}\right)^2 + 1\right] = 9$ **OR** Solve the differential equation $\frac{dy}{dx}$ - 3y cotx = sin2x ; y = 2 when x = $\frac{\pi}{2}$. Ans. $\frac{y}{\sin^3 x} = \frac{-2}{\sin x} + 4$
Q.17	Evaluate : $\int_{-1}^{1} \{x + [x]\} dx$. Ans.= -1

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Q.18	A speaks truth in 60% of the cases and B in 70% of the cases. In what percentages of cases they are likely to (i)contradict each other(ii) agree with each other, in stating same fact? **Ans.** $(i)\frac{23}{50}(ii)\frac{27}{50}$
Q.19	If $\vec{a} = \vec{i} + \vec{j} + \vec{k}$, $\vec{c} = \vec{j} - \vec{k}$ are given vectors, find a vector $\vec{b}$ satisfying the equation $\vec{a} \times \vec{b} = \vec{c}$ and $\vec{a} \bullet \vec{b} = 3$. Ans. $\vec{b} = \frac{5}{3}i + \frac{2}{3}j + \frac{2}{3}k$ **OR** Let $\vec{a} = 2\vec{i} + \vec{k}$, $\vec{b} = \vec{i} + \vec{j} + \vec{k}$ and $\vec{c} = 4\vec{i} - 3\vec{j} + 3\vec{k}$ be three vectors, find a vector $\vec{r}$ which satisfies $\vec{r} \times \vec{b} = \vec{c} \times \vec{b}$ and $\vec{r} \bullet \vec{a} = 0$. Ans. $\vec{r} = \frac{1}{3}i - \frac{20}{3}j - \frac{2}{3}k$
Q.20	Prove that: $4\tan^{-1}\frac{1}{5} - \tan^{-1}\frac{1}{70} + \tan^{-1}\frac{1}{99} = \frac{\pi}{4}$. **OR** *Solve* $\sin^{-1}x + \sin^{-1}(1-x) = \cos^{-1}x$. Ans. $x = 0, \frac{1}{2}$
Q.21	If $y = \log\left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)$, prove that $\frac{dy}{dx} = \frac{x-1}{2x(x+1)}$.
Q.22	Evaluate: $\int \sqrt{\left(\frac{1-\sqrt{x}}{1+\sqrt{x}}\right)}\,dx$. Ans. $Cos^{-1}\sqrt{x} + \left(\sqrt{x} - 2\right)\sqrt{1-x}$ OR $\left(-2\sqrt{1-x}\right) + \sqrt{x - x^2} - \frac{1}{2}\sin^{-1}(2x-1)$ **OR** Evaluate: $\int \frac{dx}{(\sin x - 1)(\sin x + 4)}$. Ans. $\frac{1}{5}\int\frac{dx}{\sin x - 1} - \frac{1}{5}\int\frac{dx}{\sin x + 4} = \frac{2}{5} \bullet \frac{1}{\tan\frac{x}{2} - 1} - \frac{2}{5\sqrt{15}}\tan^{-1}\left(\frac{4\tan\frac{x}{2} + 1}{\sqrt{15}}\right)$
	Section C
Q.23	Find the inverse of the matrix $\begin{bmatrix} -1 & 2 & 5 \\ 2 & -3 & 1 \\ -1 & 1 & 1 \end{bmatrix}$ using elementary column transformation. Ans. $A^{-1} = \frac{1}{7}\begin{bmatrix} 4 & -3 & -17 \\ 3 & -4 & -11 \\ 1 & 1 & 1 \end{bmatrix}$
Q.24	Suppose the reliability of HIV test is specified as follows. Of people having HIV, 90% of the test detects the disease but 10% go undetected. Of people not having HIV, 99% of the test is judged HIV –ve but 1% are diagnosed as showing HIV + ve. From a large population of which only 0.1% has HIV, one person is selected at random, given the HIV test, and the pathologist reports as HIV +ve. What is the probability that the person actually has HIV? Ans. Required probability $= \frac{.001 \times .9}{.001 \times .9 + .999 \times .01} = \frac{90}{1089}$ OR A fair die is rolled. If 1 turns up, a ball is picked up at random from bag A, if 2 or 3 turns up, a ball is picked up at random from bag B, otherwise a ball is picked up from bag C. Bag A contains 3 red and 2 white balls, bag B contains 3 red and 4 white balls and bag C contains 4 red and 5 white balls. The die is rolled, a bag is picked up and a ball is drawn from it. If the ball is red, what is the probability

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that bag B was picked up? Ans. $= \dfrac{\frac{1}{3}\times\frac{3}{7}}{\frac{1}{6}\times\frac{3}{5}+\frac{1}{3}\times\frac{3}{7}+\frac{1}{2}\times\frac{4}{9}} = \dfrac{90}{293}$

Q.25 Define the line of shortest distance between two skew lines .Find the magnitude and the equation of the line of the shortest distance between the following lines : $\frac{x}{2}=\frac{y}{-3}=\frac{z}{1}$ and $\frac{x-2}{3}=\frac{y-1}{-5}=\frac{z+2}{2}$ **Ans.**

$S.D.=\frac{1}{\sqrt{3}}, eq \rightarrow \frac{3x-62}{3}=\frac{y+31}{1}=\frac{3z-31}{3}\ pt.A=\left(\frac{62}{3},-31,\frac{31}{3}\right), B=\left(21,\frac{-92}{3},\frac{32}{3}\right)$

Q.26 Using integration, find the area of the region $\left\{(x,y): |x-1| \le y \le \sqrt{5-x^2}\right\}$. $\int_{-1}^{2}\sqrt{5-x^2}\,dx-\int_{-1}^{1}(1-x)dx-\int_{-1}^{2}(x-1)dx=\frac{-1}{2}+\frac{5}{2}\left\{\sin^{-1}\frac{2}{\sqrt{5}}-\sin^{-1}\left(\frac{-1}{\sqrt{5}}\right)\right\}=\frac{5\pi}{4}-\frac{1}{2}$

Q.27 Kellogg is a new cereal formed of a mixture of barn and rice that contain at least 88 gram of protein and 36 milligram of iron .knowing that barn contain 80 gram of protein and 40 milligram of iron per kg and that rice contain 100 gram of protein and 30milligram of iron per kg, find the minimum cost of producing this new cereal if bran cost ₹ 5 per kg and rice cost ₹ 4 per kg.

Ans .z = 5 x + 4 y . $x,y\ge 0;\frac{80x}{1000}+\frac{100y}{1000}\ge\frac{88}{1000}\ i.e. 20x+25y\ge 22;\frac{40x}{1000}+\frac{30y}{1000}\ge\frac{36}{1000}$

$P(600,400)=4.6kg, Q(0,1200)=4.8kg, R(1100,0)=5.5kg$

Q.28 Find the equation of the plane passing through the point P(1,1,1) and containing the line $\vec{r}=(-3\hat{i}+\hat{j}+5\hat{k})+\lambda(3\hat{i}-\hat{j}-5\hat{k})$ .Also, show that the plane contains the line $\vec{r}=(-\vec{i}+2\hat{j}+5\hat{k})+\mu(\hat{i}-2\hat{j}-5\hat{k})$. Ans $\vec{r}.(\hat{i}-2\hat{j}+\hat{k})=0$

OR

A variable plane which is at a constant distance p form the origin meets the coordinate axes in points A, B and C respectively. Through these points, planes are drawn parallel to the coordinates planes, show that locus of the point of intersection is $\frac{1}{x^2}+\frac{1}{y^2}+\frac{1}{z^2}=\frac{1}{p^2}$.

Q.29 A cylinder of greatest volume is inscribed in a cone, show that (i) $R=\frac{2}{3}h\tan\alpha$ (ii) $H=\frac{1}{3}h$ (iii) Volume of the cylinder $=\frac{4}{27}\pi h^3\tan^2\alpha$. (iv) r : R = 3 : 2. Where r, h, α are the radius, height and semi – vertical angle of the cone and R, H are the radius and height of the inscribed cylinder.

Ans H = h – x cot α $\therefore V=f(x)=\pi x^2(h-x\cot\alpha)\Rightarrow x=\frac{2h\tan\alpha}{3}\ \&\ H=\frac{h}{3}$

____________x____________

"But sooner or later , the man who wins
Is the man who thinks he can ."

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