CODE:- AG-4-3689

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।
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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. का 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}
Q.2	Check the monotonocity i.e increasing & decreasing of $f(x)=\cos 2x, [\pi/2,\pi]$.
Q.3	$Let\ \vec{a}=5\vec{i}-\vec{j}+7\vec{k}\ ,\vec{b}=\vec{i}-\vec{j}+\lambda\vec{k}\ Find\ \lambda\ such\ that\ \vec{a}+\vec{b}\ and\ \vec{a}-\vec{b}\ are\ perpendicular.$
Q.4	Find $(\vec{i}\times\vec{j})\bullet\vec{k}+(\vec{k}\times\vec{j})\bullet\vec{i}-(\vec{i}\times\vec{k})\bullet\vec{j}$
Q.5	Find the total number of one one function from set A to A if A = {1 , 2 , 3 , 4 } .
Q.6	If $\lvert\vec{a}\times\vec{b}\rvert=4$, $\lvert\vec{a}.\vec{b}\rvert=2$, then find $\lvert\vec{a}\rvert^2\lvert\vec{b}\rvert^2$.

Q.7	Find the angle made by the vector i – 4j + 8k with the z – axis.
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?
Q.9	If $\lvert A\rvert = 3$ *find the* $\lvert A^{-1}\rvert$.
Q.10	Find $\int_{-\pi}^{\pi}\left(\sin^{-93} x + x^{295}\right)dx$.
	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.
Q.12	Prove that the curves $y^2 = 4ax$ and $x\,y = c^2$ cut at right angles if $c^4 = 32\,a^4$. **OR** Find the equation of tangent to the curve $y = \sqrt{3x-2}$ which is parallel to the line 4x – 2y + 5 = 0.
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 : $\int_0^{\pi/2} \frac{x \sin x \cos x}{\sin^4 x + \cos^4 x}dx$.
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 .
Q.16	Form the differential equation of the family of circles having radii 3 . **OR** Solve the differential equation $\frac{dy}{dx}$ - 3y cotx = sin2x ; y = 2 when x = $\frac{\pi}{2}$.
Q.17	Evaluate : $\int_{-1}^{1} \{x + [x]\}dx$.
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?
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 $\vec{a} \bullet \vec{b} = 3$. **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 $\vec{r} \bullet \vec{a} = 0$.
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 $\sin^{-1} x + \sin^{-1}(1-x) = \cos^{-1} x$.
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: $\int \sqrt{\left(\frac{1-\sqrt{x}}{1+\sqrt{x}}\right)}\, dx$. **OR** Evaluate: $\int \frac{dx}{(\sin x - 1)(\sin x + 4)}$.
	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.
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? 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 that bag B was picked up?
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 $\frac{x-2}{3} = \frac{y-1}{-5} = \frac{z+2}{2}$
Q.26	Using integration, find the area of the region $\{(x, y) : \lvert x-1\rvert \le y \le \sqrt{5-x^2}\}$.
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.
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 $\vec{r} = (-\vec{i} + 2\hat{j} + 5\hat{k}) + \mu(\hat{i} - 2\hat{j} - 5\hat{k})$. 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.

____________x____________

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

CODE:- AG-5-1899 **REG.NO:-TMC -D/79/89/36**

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13. Please check that this question paper contains 3 printed pages.
14. 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.

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7.

Pre-Board Examination 2010 -11

Time : 3 Hours	अधिकतम समय : 3
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Total No. Of Pages :3	कुल पृष्ठों की संख्या : 3

CLASS – XII CBSE MATHEMATICS

Section A

Q.1 Find the maximum and minimum values, if any of $f(x) = |\sin 3x| - 3$.

Q.2	Find the direction cosines of x-axis.
Q.3	If the following matrix is skew symmetric, find the values of a, b, c.If A = $\begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$.
Q.4	Evaluate: $\int (e^{x \log a} + e^{a \log x} + e^{a \log a})\, dx$.
Q.5	Evaluate : $\int \frac{dx}{x^2 (x^4 + 1)^{3/4}}$.
Q.6	Find the point on the curve $y^2 = 8x$ for which the abscissa and ordinate change at the same rate.
Q.7	Find the inverse element of the binary relation $a \otimes b = a + b - 4$.
Q.8	The slope of tangent to curve $y = \frac{x-1}{x-2} atx = 10$.
Q.9	If $A^2 = A$ for $A = \begin{bmatrix} -1 & b \\ -b & 2 \end{bmatrix}$, then find the value of b.
Q.10	Find the value of $\sec^2 (\tan^{-1} 2)$.
	Section B
Q.11	Define a binary operation * on the set {0, 1, 2, 3, 4, 5} as $a * b = \begin{cases} a+b, & \text{if } a+b<6 \\ a+b-6, & \text{if } a+b \geq 6 \end{cases}$ Show that zero is the identity for this operation and each element *a* of the set is invertible with $6 - a$ being the inverse of *a*.
Q.12	It is given that for the function f given by $f(x) = x^3 + bx^2 + ax, x \in [1,3]$ Rolle's theorem holds with $c = 2 + \frac{1}{\sqrt{3}}$. Find the values of a and b.
Q.13	Prove that $\begin{vmatrix} a & b & c \\ a-b & b-c & c-a \\ b+c & c+a & a+b \end{vmatrix} = a^3 + b^3 + c^3 - 3abc$ .Also prove that value of determinant is always positive if a , b , c is positive real number .
Q.14	Evaluate : $\int_0^1 \sin^{-1}\left(x\sqrt{1-x} - \sqrt{x}\sqrt{1-x^2}\right) dx, 0 \leq x \leq 1$. OR Evaluate: $\int_0^{\pi/2} \sin 2x \tan^{-1}(\sin x) dx.$
Q.15	Find all the points of discontinuity of the function f (x) = $[x^2]$ on [1 , 2)where [ ] denotes the greatest integer function.
Q.16	Find the particular solution of the differential equation $(xdy - ydx) y.\sin\left(\frac{y}{x}\right) = (ydx + xdy) x \cos\frac{y}{x}$, given that $y = \pi$ when x=3.

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Q.17	Solve the differential equation: $\frac{d^2x}{dy^2} = y\sin^2 y$ .. OR Form a differential equation of the curve $xy = Ae^x + Be^{-x} + x^2$, A and B are arbitrary constants.
Q.18	An urn contains 25 balls of which 10 balls bear a mark 'X' and the remaining 15 bear mark 'Y'. A ball is drawn at random from the urn, its mark is noted down and it is replaced. If 6 balls are drawn in this way, find the probability that (i) all will bear 'X' mark. (ii) not more than 2 will bear 'Y' mark (iii) at least one ball will bear 'Y' mark (iv) the number of balls with 'X' mark and 'Y' mark will be equal . OR In a hurdle race , a player has to cross 10 hurdles . The probability that he will clear each hurdle is 5 / 6 .What is the probability that he will knock down fewer than 2 hurdles ?
Q.19	If $\vec{a}\times\vec{b} = \vec{c}\times\vec{d}$ and $\vec{a}\times\vec{c} = \vec{b}\times\vec{d}$, show that $\vec{a}-\vec{d}$ is parallel to $\vec{b}-\vec{c}$ where $\vec{a}\neq\vec{d}$ & $\vec{b}\neq\vec{c}$.
Q.20	If $y = \cot^{-1}(\sqrt{\cos x}) - \tan^{-1}(\sqrt{\cos x})$ Prove that $\sin y = \tan^2 \frac{x}{2}$.
Q.21	If $y = (x+\sqrt{x^2+1})^m$, then show that $(x^2+1)\frac{d^2y}{dx^2} + x\frac{dy}{dx} - m^2 y = 0$. OR If $y = x^x$ then prove that $\frac{d^2y}{dx^2} - \frac{1}{y}\left(\frac{dy}{dx}\right)^2 - \frac{y}{x} = 0$.
Q.22	Find the vector equation of the line parallel to the line $\frac{x-1}{2} = \frac{2-y}{-3} = \frac{z-3}{4}$ and passing through the point (2 , 4, 5) . Also find the distance between two lines .
	Section C
Q.23	If $A = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 4 & -6 \\ 3 & -2 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 20 & 2 & 34 \\ 8 & 16 & -32 \\ 22 & -13 & 7 \end{bmatrix}$ are two square matrices, find AB and hence Solve the system of linear equation : $\frac{2}{x}+\frac{3}{y}+\frac{4}{z} = -3;; \frac{5}{x}+\frac{4}{y}-\frac{6}{z} = 4; \frac{3}{x}-\frac{2}{y}-\frac{2}{z} = 6$.
Q.24	Evaluate : $\int \frac{1}{\sin x(5-4\cos x)}dx$.
Q.25	Two bag A and B contains 4 white and 3 black balls and 2 white and 2 black balls respectively. From bag A, two balls are drawn at random and then transferred to bag B. A ball is then drawn from bag B and is found to be a black ball. What is the probability that the transferred balls were 1 white and 1 black?
Q.26	Draw the rough sketch of the region enclosed between the circles $x^2+y^2=4$ and $(x-2)^2+y^2=1$. Using integration, find the area of the enclosed region . OR Prove that the curves $y^2 = 4x$ & $x^2 = 4y$ divide the area of square bounded by x = 0 , x = 4 , y = 4 and y = 0 into three equal parts .

Q.27	A toy company manufactures two types of dolls , A & B . Market tests and available recourses have indicated that the combined production level should not exceeds 1200 dolls per week and the demand for dolls of type B is at most half of that for doll of type A. Further the production level of dolls of type A can exceeds three times the production of dolls of other type by at most 600 units . If the company makes profit of ₹ 12 and ₹ 16 per doll respectively on doll A and B ,how many each should be produce weekly in order to maximum profit ?
Q.28	Find the vector and Cartesian equation of the plane containing the two lines $\vec{r} = 2i + j - 3k + \lambda(i + 2j + 5k)$; $\vec{r} = 2i + j - 3k + \mu(3i - 2j + 5k)$. Also find the inclination of this plane with the XZ plane .
Q.29	A tank with rectangular base and rectangular sides, open at the top is to be constructed so that its depth is 2 m and volume is 8 m3. If building of tank costs ₹ 70 per sq meters for the base and ₹ 45 per square meter for sides. What is the cost of least expensive tank? OR A helicopter is flying along the curve $y = x^2 + 2$. A soldier is placed at the point (3, 2). Find the nearest distance between the soldier and the helicopter.
	___________x___________
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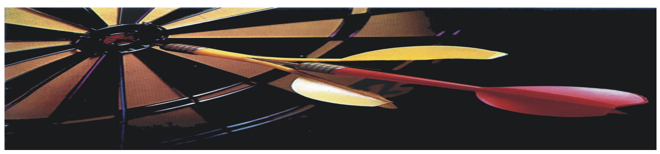

CODE:- AG-6-1899

REG.NO:-TMC -D/79/89/36

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7. प्रश्न–पत्र मे

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Pre-Board Examination 2010 -11

Time : 3 Hours	अधिकतम समय : 3
Maximum Marks : 100	अधिकतम अंक : 100
Total No. Of Pages :5	कुल पृष्ठों की संख्या : 5

CLASS – XII CBSE MATHEMATICS

Section A

Q.1	Find λ, μ if $(2i+26j+27k)\times(i+\lambda j+\mu k)=0$. λ, μ ज्ञात कीजिए यदि $(2i+26j+27k)\times(i+\lambda j+\mu k)=0$.
Q.2	$A=(a_{ij})=\begin{pmatrix}2&3&-5\\1&4&9\\0&7&-2\end{pmatrix}$ and $B=(b_{ij})=\begin{pmatrix}2&1&-1\\-3&4&4\\1&5&2\end{pmatrix}$ then find $a_{22}+b_{21}$. यदि $A=(a_{ij})=\begin{pmatrix}2&3&-5\\1&4&9\\0&7&-2\end{pmatrix}$ तथा $B=(b_{ij})=\begin{pmatrix}2&1&-1\\-3&4&4\\1&5&2\end{pmatrix}$ तो $a_{22}+b_{21}$. ज्ञात कीजिए
Q.3	Evaluate: को हल कीजिए। $\int \frac{2x}{x^4+2x^2+3}dx$.
Q.4	A is a matrix of order 3×3. Comment upon the statement, with reasons $\lvert 3A\rvert = 9\lvert A\rvert$. एक 3×3 कोटि के आव्यूह की विवेचना कथन $\lvert 3A\rvert = 9\lvert A\rvert$ के साथ कीजिए।
Q.5	If $\vec{a} = i + j + k$, $\vec{b} = 4i - 2j + 3k$ and $\vec{c} = \hat{i} - 2\hat{j} + \hat{k}$, find a vector of magnitude 6 units which is parallel to the vector $2\vec{a} - \vec{b} + 3\vec{c}$. यदि $\vec{a} = i + j + k$, $\vec{b} = 4i - 2j + 3k$ तथा $\vec{c} = \hat{i} - 2\hat{j} + \hat{k}$, है, तो सदिश $2\vec{a} - \vec{b} + 3\vec{c}$ से समांतर 6 इकाई परिमाण का एक सदिश ज्ञात कीजिए।
Q.6	The probability that A hits a target is $\frac{1}{3}$ and the probability that B hits it is $\frac{2}{5}$.If each one of A and B shoots at the target, what is the probability that the target is hit ? A के लक्ष्यभेदन की प्रायिकता $\frac{1}{3}$ तथा B के लक्ष्यभेदन की प्रायिकता $\frac{2}{5}$ है। यदि A और B दोनों लक्ष्यभेदन का प्रयास करें, तो प्रायिकता क्या है कि लक्ष्यभेदन हो जाए?तथा
Q.7	Let set A = {3, 5, 6} and set B = {1 ,4 }. A relation R from set A to set B is defined as R = {(a,b) ∈ A×B: a–b is an even number}. List the elements of relation R. यदि समुच्चय A = {3, 5, 6} और समुच्चय B = {1,4} में सबंधं R R= {(a,b) ∈ A×B: a–b एक समसंख्या है}, तो सम्बन्ध R के सभी अवयव ज्ञात कीजिए।
Q.8	If $f(x) = x^2 + 1$, then $f^{-1}(17)$. यदि $f(x) = x^2 + 1$, तब $f^{-1}(17)$ ।
Q.9	Find the angle between the line $\frac{x-2}{3}=\frac{y+1}{-1}=\frac{z-3}{2}$ and the plane $3x+4y+z+5=0$.

	रेखा $\frac{x-2}{3}=\frac{y+1}{-1}=\frac{z-3}{2}$ और समतल $3x+4y+z+5=0$ के बीच का कोण ज्ञात कीजिए।
Q.10	If $\mathbf{a}=\mathbf{i}+\mathbf{j}+\mathbf{k},\mathbf{b}=\mathbf{i}+3\mathbf{j}+5\mathbf{k}$ and $\mathbf{c}=7\mathbf{i}+9\mathbf{j}+11\mathbf{k}$, then find the area of the parallelogram having diagonals $\mathbf{a}+\mathbf{b}$ and $\mathbf{b}+\mathbf{c}$. यदि $\mathbf{a}=\mathbf{i}+\mathbf{j}+\mathbf{k},\mathbf{b}=\mathbf{i}+3\mathbf{j}+5\mathbf{k}$ तथा $\mathbf{c}=7\mathbf{i}+9\mathbf{j}+11\mathbf{k}$ हों, तो विकर्ण $\mathbf{a}+\mathbf{b}$ तथा $\mathbf{b}+\mathbf{c}$ वाले समान्तर चतुर्भुज का क्षेत्रफल है
	Section B
Q.11	Prove that: सिद्ध कीजिए कि: $\int_0^{\pi}\frac{x\tan x}{\sec x+\tan x}dx=\frac{\pi}{2}(\pi-2)$.
Q.12	Differentiate $\tan^{-1}\left(\frac{\sqrt{1+x^2}-\sqrt{1-x^2}}{\sqrt{1+x^2}+\sqrt{1-x^2}}\right)$ with respect to $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$. $\tan^{-1}\left(\frac{\sqrt{1+x^2}-\sqrt{1-x^2}}{\sqrt{1+x^2}+\sqrt{1-x^2}}\right)$ का $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ के सापेक्ष अवकलन कीजिए।
Q.13	Find the particular solution of the differential equation $(1+y^2)dx+\left(x-e^{\tan^{-1}y}\right)dy=0,\ y(0)=0$. अवकल समीकरण $(1+y^2)dx+\left(x-e^{\tan^{-1}y}\right)dy,\ y(0)=0$ का हल ज्ञात कीजिए।
Q.14	Find the equation of the plane passing through the point (-1, -1, 2) and perpendicular to the planes $3x+2y-3z=1$ and $5x-4y+z=5$. बिंदु (-1, -1, 2) से होकर जाने वाले तथा समतलों $3x+2y-3z=1$ तथा $5x-4y+z=5$ पर लंब समतल का समीकरण ज्ञात कीजिए। or अथवा Find the equation of the plane passing through the points (3,-1, 2) and (0, 0, 0) and parallel to the lime $\frac{x-4}{1}=\frac{y+3}{-4}=\frac{z+1}{7}$. उस तल का समीकरण ज्ञात कीजिए जो बिन्दुओं (3, - 1 , 2) और (0, 0, 0) से होकर जाता है तथा सरल रेखा $\frac{x-4}{1}=\frac{y+3}{-4}=\frac{z+1}{7}$ के समान्तर है।
Q.15	Show that $y=\cos(\cos x)$ is a solution of the differential equation . $\frac{d^2y}{dx^2}-\cot x\frac{dy}{dx}+y\sin^2 x=0$. सिद्ध कीजिए कि $y=\cos(\cos x)$ का अवकल समीकरण $\frac{d^2y}{dx^2}-\cot x\frac{dy}{dx}+y\sin^2 x=0$. है।
Q.16	The length x of a rectangle is decreasing at the rate of 5 cm/minute and the width y is increasing at the rate of 4 cm/minute. When x = 8 cm and y = 6 cm, find the rate of change of (a) the perimeter, (b) the area of the rectangle. एक आयत की लंबाई x, 5 सेमी/मिनट की दर से घट रही है और चौड़ाई y, 4 सेमी/मिनट की दर से बढ़ रही है। जब x = 8 सेमी और y = 6 सेमी

Q.17 Using properties of determinants, prove : ` हुए सिद्ध कीजिए कि

: $\begin{vmatrix} -bc & b^2+bc & c^2+bc \\ a^2+ac & -ac & c^2+ac \\ a^2+ab & b^2+ab & -ab \end{vmatrix} = (bc+ca+ab)^3$.

Q.18 Prove the following : निम्न को सिद्ध कीजिए : $\cot^{-1}\left(\dfrac{\sqrt{1+\sin x}+\sqrt{1-\sin x}}{\sqrt{1+\sin x}-\sqrt{1-\sin x}}\right)=\dfrac{x}{2},\ x\in\left(0,\dfrac{\pi}{4}\right)$

or अथवा

Solve for x : Solve for x : x के लिए हल कीजिए : $\tan^{-1}\dfrac{1}{4}+2\tan^{-1}\dfrac{1}{5}+\tan^{-1}\dfrac{1}{6}+\tan^{-1}\dfrac{1}{x}=\dfrac{\pi}{4}$.

Q.19 Let $f : N \to N$ be defined by $f(n)=\begin{cases}\dfrac{n+1}{2}, & \text{if n is odd}\\ \dfrac{n}{2}, & \text{if n is even}\end{cases}$ for all $n \in N$. Find whether the function f is bijective.

माना कि समस्त $n \in N$ के लिए $f(n)=\begin{cases}\dfrac{n+1}{2}, & \text{यदि n विषम है}\\ \dfrac{n}{2}, & \text{यदि n सम है}\end{cases}$ द्वारा पारिभाषित एक फलन $f : N \to N$ है। ज्ञात कीजिए कि क्या फलन f एकैकी आच्छादी (bijective) है।

Q.20 The scalar product of the vector $\hat{i}+\hat{j}+\hat{k}$ with the unit vector along the sum of vectors $2\hat{i}+4\hat{j}-5\hat{k}$ and $\lambda\hat{i}+2\hat{j}+3\hat{k}$ is equal to one. Find the value of λ.

सदिशों $2\hat{i}+4\hat{j}-5\hat{k}$ तथा $\lambda\hat{i}+2\hat{j}+3\hat{k}$ के योगफल की दिशा में मात्रक सदिश से सदिश $\hat{i}+\hat{j}+\hat{k}$ का अदिश गुणनफल 1 है। λ का मान ज्ञात कीजिए।

Q.21 Evaluate : मान ज्ञात कीजिए $\int \dfrac{\tan x+\tan^3 x}{1+\tan^3 x}dx$. or अथवा Evaluate : मान ज्ञात कीजिए $\int \dfrac{(x^2+1)(x^2+4)}{(x^2+3)(x^2-5)}dx$.

Q.22 Bag A contains 4 red and 5 black balls, while bag B has 3 red and 7 black balls. One ball is drawn from bag A and two from bag B. Find the probability that out of the three balls drawn, two are red and one is black.थैला A में 4 लाल तथा 5 काली गेंदे है जबकि थैला B में 4 लाल तथा 7 काली गेंदे है। थैला A से एक गेंद तथा थैला B से 2 गेंदे निकाली जाती है। तीन गेंदों में से दो लाल तथा एक काली गेंद होने की प्रायिकता ज्ञात कीजिए।

or अथवा

On a multiple choice examination with three possible answers (out of which only one is correct) for each of the five questions, what is the probability that a candidate would get four or more correct answers just by guessing?

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Section C

Q.23	If $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$, find A^{-1} and use it to solve the system of equations: $x + 2y + z = 4$, $-x + y + z = 0$ & $x - 3y + z = 2$. यदि $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ तो A^{-1} का मान ज्ञात कीजिए तथा इसका उपयोग समीकरण : $x + 2y + z = 4$, $-x + y + z = 0$ & $x - 3y + z = 2$.को हल करने में कीजिए।
Q.24	Find the area enclosed between the curves $y = \sin x$ and $y = \cos x$ that lies between the lines $x = 0$ and $x = \pi/2$. OR Find the area of smaller region bounded by the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ and the straight line $\frac{x}{4}+\frac{y}{3}=1$. $y = \sin x$ तथा $y = \cos x$ के मध्य घिरे क्षेत्र का क्षेत्रफल ज्ञात कीजिए जो कि $x = 0$ तथा $x = \pi/2$ के मध्य स्थित है। या $\frac{x^2}{16}+\frac{y^2}{9}=1$ तथा सरल रेखा $\frac{x}{4}+\frac{y}{3}=1$ के बीच घिरे हुए न्यूनतम भाग का क्षेत्रफल ज्ञात कीजिए।
Q.25	An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident involving a scooter, a car and a truck are 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver. एक बीमा कम्पनी 2000 स्कूटर चालकों, 4000 कार चालकों तथा 6000 ट्रक चालकों का बीमा करती है। एक स्कूटर, कार तथा ट्रक के दुर्घटनाग्रस्त होने .01, 0.03 तथा 0. प्रायिकता क्या है?
Q.26	Evaluate : मान ज्ञात कीजिए $\int_0^{\pi} \frac{x}{a^2 \cos^2 x + b^2 \sin^2 x} dx$.
Q.27	Find the area of the greatest isosceles triangle that can be inscribed in a given ellipse having its vertex coinciding with one extremity of major axis. ो समबाहु त्रिभ पर है। or अथवा Show that the height of the cylinder of maximum volume that can be inscribed in a sphere of radius R is $\frac{2R}{\sqrt{3}}$. Also find the maximum volume. दर्शाइए कि एक R $\frac{2R}{\sqrt{3}}$ है। अधिकतम आयतन भी ज्ञात कीजिए।
Q.28	Find the distance of the point P(6, 5, 9) from the plane determined by the points A (3, –1, 2), B(5, 2, 4) and C (–1, –1, 6). बिन्दु P(6, 5, 9) की बिन्दुओं A (3, –1, 2), B(5, 2, 4) तथा C (–1, –1, 6). के द्वारा निर्धारित समतल से दूरी ज्ञात कीजिए।

Q.29	An oil company requires 12,000; 20,000 and 15,000 barrels of high grade, medium grade and low grade oil respectively. Refinery A produces 100, 300 and 200 barrels per day of high, medium and low grade oil respectively whereas the Refinery B produces 200, 400 and 100 barrels per day respectively. If A costs ₹ 400 per day and B costs ₹ 300 per day to operate ,how many days shoud each be run to minimize cost while satisfying requirements . एक तेल कम्पनी को 12 A 200 बैरल प्रतिदिन उच्च, मध्यम तथा निम्न श्रेणी का उत्पादन करती है तथा B यदि A दन 400 रू तथा B लगेंगे?
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	BELIEVE IN YOUR SELF ***YOU CAN DO IT!***