CODE:- AG-5-7989 **REGNO:-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 4 question of four marks and 2 questions of six marks each. You have to attempt only one If the alternatives in all such questions.
5. Use of calculator is not permitted.
6. Please check that this question paper contains 5 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 4 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 5 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 2011 -12

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***

PART – A

Q.1	Find the maximum and minimum values, if any of $f(x)=\|\sin 3x\|-3$. Ans .max =-2, mini=-3
Q.2	Find the direction cosines of x-axis. Ans (1,0,0).
Q.3	If the following matrix is skew symmetric, find the values of a, b, c.If $A=\begin{bmatrix}0 & a & 3\\ 2 & b & -1\\ c & 1 & 0\end{bmatrix}$. Ans a= -2,b= 0,c = -3
Q.4	Evaluate: $\int(e^{x\log a}+e^{a\log x}+e^{a\log a})\,dx$. Ans . $\frac{a^x}{\log a}+\frac{x^{a+1}}{a+1}+a^a x+c$
Q.5	Evaluate : $\int\frac{dx}{x^2(x^4+1)^{3/4}}$. Ans= $-\left(1+x^{-4}\right)^{\frac{1}{4}}+c$
Q.6	Find the point on the curve $y^2=8x$ for which the abscissa and ordinate change at the same rate. Ans $\frac{dy}{dx}=1$ (2 , 4)
Q.7	Find the inverse element of the binary relation $a\otimes b=a+b-4$. Ans e = 4,d = 8-a Ans=
Q.8	The slope of tangent to curve $y=\frac{x-1}{x-2}$ at $x=10$. Ans $\frac{dy}{dx}=-\frac{1}{64}$
Q.9	If $A^2=A$ for $A=\begin{bmatrix}-1 & b\\ -b & 2\end{bmatrix}$, then find the value of b. Ans b=$\pm\sqrt{2}$
Q.10	Find the value of $\sec^2(\tan^{-1}2)$. Ans = 5

PART – B

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Q.11	Define a binary operation * on the set {0, 1, 2, 3, 4, 5} as $a * b = \begin{cases} a+b, & \text{if } a+b<6 \\ a+b-6, & \text{if } a+b \ge 6 \end{cases}$. 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. Ans a = 11 ; b = -6
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 : $\int_0^1 \sin^{-1}\left(x\sqrt{1-x} - \sqrt{x}\sqrt{1-x^2}\right)dx, 0 \le x \le 1$. Ans $= \frac{\pi}{4} - 1$ OR Evaluate: $\int_0^{\pi/2} \sin 2x \tan^{-1}(\sin x)dx$. Ans $= \frac{\pi}{2} - 1$
Q.15	Find all the points of discontinuity of the function f (x) = $[x^2]$ on [1 , 2) where [ ] denotes the greatest integer function. Ans f (x) = $\begin{cases} 1 \; ; & x \in [1, \sqrt{2}) \\ 2 \; ; & x \in [\sqrt{2}, \sqrt{3}) \\ 3 \; ; & x \in [\sqrt{3}, 2) \end{cases}$ at x = $\sqrt{2}; RHL = 2 \,\&\, LHL = 1 \therefore RHL \ne LHL$ at $= \sqrt{3}; RHL = 3 \,\&\, LHL = 2 \therefore RHL \ne LHL$ there fore poit of discontinuity $\sqrt{2} \,\&\, \sqrt{3}$ on [1 , 2)
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. Ans $\sec\frac{y}{x} = \frac{2xy}{3\pi}$
Q.17	Solve the differential equation: $\frac{d^2x}{dy^2} = y\sin^2 y$.. Ans $x = \frac{y^3}{12} + \frac{y}{8}\cos 2y - \frac{\sin 2y}{8}$ OR Form a differential equation of the curve $xy = Ae^x + Be^{-x} + x^2$, A and B are arbitrary constants. Ans $x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = xy - x^2 + 2$
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 . Ans (i) $\frac{64}{15625}$ (ii) $\frac{2796}{15625}$ (iii) $\frac{15561}{15625}$ (iv) $\frac{864}{3125}$ 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 ? Ans $\frac{5^9 \times 15}{6^{10}} = \frac{5^{10}}{6^{10}} \times 3$

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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 $(x^2+1)\frac{d^2y}{dx^2}+x\frac{dy}{dx}-m^2y=0$. 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 . Ans $\vec{r}=(2i+4j+5k)+\lambda(2i+3j+4k)$ S.D. $=\frac{\left\|\left(\vec{a_2}-\vec{a_1}\right)\times\vec{b}\right\|}{\left\|\vec{b}\right\|}=\frac{\sqrt{5}}{\sqrt{29}}$ & $\left(\vec{a_2}-\vec{a_1}\right)\times\vec{b}=2i-k$

PART – 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 : $\frac{2}{x}+\frac{3}{y}+\frac{4}{z}=-3;;\frac{5}{x}+\frac{4}{y}-\frac{6}{z}=4;\frac{3}{x}-\frac{2}{y}-\frac{2}{z}=6$. Ans $\begin{bmatrix}1\\-1\\-2\end{bmatrix}$
Q.24	Evaluate : $\int\frac{1}{\sin x(5-4\cos x)}dx$. Ans. $\frac{1}{2}\log(1-\cos x)-\frac{1}{18}\log(1+\cos x)-\frac{4}{9}\log((5-4\cos x)$
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? Ans Required Probability $=\frac{\frac{24}{42}\times\frac{3}{6}}{\frac{12}{42}\times\frac{2}{6}+\frac{6}{42}\times\frac{4}{6}+\frac{24}{42}\times\frac{3}{6}}=\frac{3}{5}$
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 . Ans Required Area = $2\left\{\int_1^{7/4}\sqrt{1-(x-2)^2}\,dx+\int_{7/4}^{2}\sqrt{4-x^2}\,dx\right\}=\frac{5\pi}{2}-\frac{\sqrt{15}}{2}-\sin^{-1}\left(\frac{1}{4}\right)-4\sin^{-1}\left(\frac{7}{8}\right)$ sq. unit 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 . Ans $A_1=\int_0^4\left(x-\sqrt{4x}\right)dx=A_2=\int_0^4\left(\sqrt{4x}-\frac{x^2}{4}\right)dx=A_3=\int_0^4\left(\frac{x^2}{4}\right)dx=\frac{16}{3}$

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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 ? Ans: $x \ge 0; y \ge o; x + y \le 1200; y \le \frac{x}{2}; x \le 3y + 600; P = 12x + 16y$ CORNER POINTS : (0,0) ; (600, 0) (1050, 150) ; (800 , 400) . Z is maximum at (800 , 400) . there fore 800 of type A and 400 of type B should be produce to get 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 . Ans $\theta = \cos^{-1}\left(\frac{5}{\sqrt{141}}\right)$ eq $10x + 5y - 4z = 37$

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? Ans : L = x & B = y $xy = 4 : \cos t = l \times b + 2 \times h(l + b) \times 45$ $f(x) = 70xy + 2 \times 2 \times (x + y) \times 45 = 280 + 180x + \frac{720}{x} \Rightarrow f'(x) = 0 \Rightarrow x = 2$ Cost of least Expansion 1000 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. Ans $f(x) = (x-3)^2 + x^4 \Rightarrow (1,3) \& D = \sqrt{5}$
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	DON'T FALL BEFORE YOU'RE PUSHED.

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