Year of Quality education 18th

Code No. **Series AG-F2** **TMG-D/79/89**

- Please check that this question paper contains 4 printed pages.
- 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.
- Please check that this question paper contains 29 questions.

General Instructions: -

1. All questions are compulsory.
2. The question paper consists of 29 questions divided into three sections A, B and C. Section A contains 10 questions of 1 marks each, Section B is of 12 questions of 4 marks each and Section C is of 7 questions of 6 marks each.
3. Write the serial number of the question before attempting it.
4. If you wish to answer any question already answered, cancel the previous answer.
5. In questions where internal choices is provided. You must attempt only one choice.

Pre-Board Examination 2009 -10

Time: 3 hrs. ***M.M.: 100***

CLASS – XII MATHEMATICS

Q.1	If $f(1)=4$; $f'(1)=2$, find the value of the derivative of log $f(e^x)$ w.r.t. x at the point x= 0.
Q.2	Find x if $\tan^{-1}4+\cot^{-1}x=\frac{\pi}{2}$
Q.3	Let f, g : $R\to R$ be defined as f(x)=$\lvert x\rvert$ and g(x)=$[x]$where $[x]$denotes the greatest integer less than or equal to x. Find gof $\left(-\sqrt{2}\right)$.
Q.4	If A is square matrix such that $A^2=A$, then write the value of$(I+A)^3-7$ A .
Q.5	If A=$\begin{bmatrix}\cos\theta & -\sin\theta\\ \sin\theta & \cos\theta\end{bmatrix}$ then find the value of θ satisfying the equation $A^T+A=I_2$.
Q.6	Let $f:R-\{-\frac{3}{5}\}\to R$ be a function as $f(x)=\frac{2x}{5x+3}$, Find f^{-1} .
Q.7	In a triangle ABC, the sides AB and BC are represented by vectors $2\hat{i}-\hat{j}+2\hat{k}$, $\hat{i}+3\hat{j}+5\hat{k}$ respectively. Find the vector representing CA.
Q.8	If $\vec{a}$ & $\vec{b}$ are two unit vectors such that $\lvert\vec{a}+\vec{b}\rvert=\sqrt{3}$, find $(2\vec{a}-5\vec{b}).(3\vec{a}+\vec{b})$.
Q.9	Evaluate: $\int_0^{\pi/2}\log\left[\frac{3+5\cos x}{3+5\sin x}\right]dx$.
Q.10	Write the value of λsuch that the line $\frac{x-2}{9}=\frac{y-1}{\lambda}=\frac{z+3}{-6}$ is perpendicular to the

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	plane 3x-y-2z = 7.
	Section B
Q.11	In an examination, 8 questions of true- false type are asked. A student tosses a fair die to determine his answer to each question. If the die show odd prime , he answers true otherwise, he answers false. Find that the probability that he answers at most 6 questions correctly .
Q.12	Given that vectors A, B,C form a triangle such that A = B + C. Find a,b,c,d such that the area of the triangle is $5\sqrt{6}$ where A = ai+bj+ck, B = di+3j+4k, C = 3i +j - 2k
Q.13	Evaluate: $\int e^x \frac{x^2+1}{(x+1)^2} dx$
Q.14	Discuss the differentiability of f(x) = $\begin{cases} 1-x & x<1 \\ (1-x)(2-x) & 1 \le x \le 2 \\ 3-x & x>2 \end{cases}$ at x = 1 & x = 2 . **Or** Find all the points of discontinuity of the function f (x) = $[x^2]$ on $[1,2)$ where [] denotes the greatest integer function .
Q.15	Verify Roll'es theorem for the function f(x) = $(x-a)^m (x-b)^n$ on the internal [a,b] where m, n are positive integers. **Or** Show that the curves $4x = y^2$ & $4xy = k$ cut at right angles, if $k^2 = 512$.
Q.16	Solve the following differential equation : $(1+ y + x^2 y)\,dx + (x + x^3)\,dy = 0$, where y =0 when x=1 . **Or** 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.
Q.17	Evaluate : $\int_0^1 \sin^{-1}\left(x\sqrt{1-x} - \sqrt{x}\sqrt{1-x^2}\right)dx, 0 \le x \le 1$.
Q.18	**Prove that :** $\begin{vmatrix} -2a & a+b & a+c \\ b+a & -2b & b+c \\ c+a & c+b & -2c \end{vmatrix} = 4(b+c)(c+a)(a+b)$.
Q.19	Show that the line $\vec{r} = 4\hat{i} - 7\hat{k} + \lambda(4\hat{i} - 2\hat{j} + 3\hat{k})$ is parallel to the plane

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$\vec{r}.(5\hat{i}+4\hat{j}-4\hat{k})=7.$ Also find the distance from point to plane .

Or

If $\vec{a},\vec{b}$ & $\vec{c}$ are three vectors such that $\vec{a}\times\vec{b}=\vec{c},\vec{b}\times\vec{c}=\vec{a};\vec{c}\times\vec{a}=\vec{b}$, prove that $\vec{a},\vec{b},\vec{c}$ are right handed system of orthogonal unit vector .

Q.20 Solve for x : $\tan^{-1}2x+\tan^{-1}3x=\frac{\pi}{4}$.

Q.21 If $y=(\sin x)^{\tan x}+(\cos x)^{\sec x}$ find $\frac{dy}{dx}$.

Q.22 Find the equation of the plane passing through the points (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 $\vec{r}=(-\hat{i}+2\hat{j}+5\hat{k})+\lambda(\hat{i}-2\hat{j}-5\hat{k})$.

Or

Find the distance from the point 2i-3j+5k to the line $\vec{r}$=(11i-2j-8k)+λ(10i-4j-11$\hat{k}$).

Section C

Q.23 Using matrices , solve the following system of equations: $x+\frac{2}{y}+3xz=-1;2x-\frac{4}{y}-3xz=3;3x+\frac{6}{y}-2xz=4$.

Q.24 A firm makes two types of furniture: chairs and tables. The contribution to profit for each product as calculated by the accounting department is Rs 20 per chair and 30 per table. Both products are to be processed on three machines and .The time required in hours by each product and total available in hours per week on each machine are as follows:

Machine	Chair	Table	Available Time
M1	3	3	36
M2	5	2	50
M3	2	6	60

How should the manufacture schedule their production in order to maximize profit?

Q.25 Prove that the function $f:R-\{3\}\to R-\{1\}$ given by $f(x)=\frac{x-2}{x-3}$ is bijection.

Q.26 Using integration, find the area of the region $\left\{(x,y):|x-1|\le y\le\sqrt{5-x^2}\right\}$.

Or

Draw the rough sketch of the region enclosed between the circles $x^2+y^2=9$ and $(x-3)^2+y^2=1$. Using integration, find the area of the enclosed region.

Q.27 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

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	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.28	Show that the lines $\frac{x+4}{3}=\frac{y+6}{5}=\frac{z-1}{-2}$ and 3x-2y+z+5 = 0 = 2x + 3y + 4z - 4 intersect. Find equation of plane in which they lie and also their point of intersection.
Q.29	A square piece of tin of side 24cm is to be made into a box without top by cutting a square from each corner and folding up the flaps to form a box .What should be the side of the square to be cut off so that the volume of the box is maximum? Also find this maximum volume . **Or** A point on the hypotenuse of a right triangle is at distance a and b from the sides of the triangle. Show that the minimum length of the hypotenuse is $\left(a^{\frac{2}{3}}+b^{\frac{2}{3}}\right)^{\frac{3}{2}}$.
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