Code No. **Series AG-F4** **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

Section A

Q.1	Let A = {2, 3, 4, 5, 6, 7, 8, 9}. Let R be the relation on A defined by R = {(x, y) : x $\in$ A, y $\in$ A and x divides y}. Find set R as a order pair .
Q.2	If a line makes angle 90^o, 60^o and 30^o with the positive direction x, y and z respectively, find its direction consines.
Q.3	Find a matrix X such that 2A + B + X = 0, where A = $\begin{bmatrix} -1 & 2 \\ 3 & 4 \end{bmatrix}$; B = $\begin{bmatrix} 3 & -2 \\ 1 & 5 \end{bmatrix}$.
Q.4	Find λ so that the four points with p.v. $-\hat{j}+\hat{k}$, $2\hat{i}-\hat{j}-\hat{k}$, $\hat{i}+\lambda\hat{j}+\hat{k}$ and $3\hat{j}+3\hat{k}$ are coplanar.
Q.5	Write the order and degree of the differential equation, $y = x\frac{dy}{dx} + a\sqrt{1+\left(\frac{dy}{dx}\right)^2}$.
Q.6	If f(x) = $\frac{x-1}{x+1}$ (x $\neq$ 1, -1), show that fof^{-1} is an identity function.
Q.7	If y = x^4 + 10 and x – changes from 2 to 1.99, find the approximate change in y.
Q.8	A die is rolled. If the outcome is an even number, what is the probability that it is a prime number?
Q.9	Let f, g be the function f = {(1, 5), (2, 6), (3, 4)}, g = {(4, 7), (5, 8), (6, 9)}. What is the range of f and g?
Q.10	Evaluate : $\int \frac{1+\tan x}{x+\log\sec x}dx$.

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Section B

Q.11 Let f : {2, 3, 4, 5} $\rightarrow$ {3, 4, 5, 9} and g : {3, 4, 5, 9} $\rightarrow$ {7, 11, 15} be functions defined as f (2) = 3, f(3) = 4, f(4) = f(5) = 5 and g(3) = g(4) = 7 and g(5) = g(9) = 11. Find gof.

Q.12 Using Rolle's theorem, find the points on the curve $y = x^2$, $x \in [-2, 2]$, where the tangent is parallel to the x – axis.

Or

Show that the curves $xy = a^2$ and $x^2 + y^2 = 2a^2$ touch each other.

Q.13 If a, b and c are real numbers and $\begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 0$ Show that either a + b + c = 0 or a = b = c.

Q.14 Using properties of integrals, evaluate : $\int_{-\pi/2}^{\pi/2} f(x)dx$, where f(x) = sin|x|+ cos |x| .

Q.15 Find all the points of discontinuity of the function f defined by f(x) = $\begin{cases} x+2, & x \le 1 \\ x-2, & 1 < x < 2 \\ 0, & x \ge 2 \end{cases}$.

Q.16 Solve the following differential equation : $(y + xy)dx + (x - xy^2)dy = 0$.

Or

Solve the differential equation : $(x + 2y^2)\frac{dy}{dx} = y$, given that when x = 2, y = 1.

Q.17 Evaluate : $\int \frac{(x^2+1)(x^2+4)}{(x^2+3)(x^2-5)}dx$.

Q.18 Three bags contain 5 white, 8 red, 7 white 6 red and 6 white, 5 red balls respectively. One ball is drawn from each bag at random. Find the probability that all the three balls drawn area of the same colour.

Q.19 Show that the points A, B, C and D with position vectors $\vec{a}, \vec{b}, \vec{c}$ and $\vec{d}$ respectively such that $2\vec{a} + 3\vec{b} - \vec{c} - 4\vec{d} = \vec{0}$ are coplanar.

Or

For any two vectors $\vec{a}$ and $\vec{b}$, show that $(1 + |\vec{a}|^2)(1 + |\vec{b}|^2) = (1-\vec{a}.\vec{b})^2 \, |\vec{a}+\vec{b}+|\vec{a}\times\vec{b})|^2$.

Q.20 Find the value of : $2\tan^{-1}\left(\frac{1}{5}\right) + \sec^{-1}\left(\frac{5\sqrt{2}}{7}\right) + 2\tan^{-1}\frac{1}{8}$.

Q.21 If $y = \sqrt{\frac{1-\sin 2x}{1+\sin 2x}}$, show that $\frac{dy}{dx} + \sec^2\left(\frac{\pi}{4} - x\right) = 0$.

Q.22 The Cartesian equations of a line are 6x – 2 = 3y + 1 = 2z – 2. Find (a) the direction ratios of the line, and (b) Cartesian and vector equations of the line parallel to this line and passing through the point (2, -1, -1).

Or

Find the equation of the plane passing through the intersection of the planes, 2x + 3y – z + 1 = 0 ; x + y – 2z + 3 = 0 and perpendicular the plane 3x – y – 2z – 4 = 0. also the inclination of this plane with the xy plane.

Section C

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Q.23 Obtain the inverse of the following matrix using elementary operations A = $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$.

Q.24 A firm manufactures two types of products A and B and shells them at a profit to Rs. 5 per unit of type A and Rs.3 per unit of type B. Each product is processed on two machines M_1 and M_2. One unit of type A requires one minute of processing time on M_1 and two minutes of processing time on M_2; whereas one unit of type B require one minute of processing time on M_1 and one minute of M_2. Machines M_1 and M_2 are respectively available for at most 5 hours and 6 hours in a day. Find out how many units of each type of product should firm produce a day in order to maximize the profit. Solve the problem graphically.

Or

iture firm manufactures chairs and tables, each requiring the use of three machines A, B and C. Production of one chair requires 2 hours on machine A, 1 hour on machine B and 1 hour on machine C. Each table requires 1 hour each on machine A and B and 3 hours on machine C. The profit obtained by selling one chair in Rs. 30 while by selling one table the profit is Rs. 60. The total time available per week on machine A is 70 hours, on machine B is 40 hours and on machine C is 90 hours. How many chairs and tables should be made per week so as to maximize profit? Formulate the problem as L.P.P. and solve it graphically

Q.25 Evaluate: $\int \frac{e^{\tan^{-1} x}}{(1+x^2)^2} dx$.

Q.26 Sketch the graph of f(x) = $\begin{cases} |x-2|+2, & x \le 2 \\ x^2-2, & x > 2 \end{cases}$ .Evaluate $\int_0^4 f(x)dx$. What does the value this integral represent on the graph?

Or

Find the ratio of the areas into which curve $y^2 = 6x$ divides the region bounded by $x^2 + y^2 = 16$.

Q.27 Three bags contain balls as shown in the following table:

Bag	Number of		
	White balls	**Black balls**	**Red balls**
I	1	2	3
II	2	1	1
III	4	3	2

A bag is chosen at random and two balls are drawn. They happen to be white and red. What is the probability that they came from the third bag?

Q.28 Define the line of shortest distance between two skew lines. Find the shortest distance and the vector equation of the line of shortest distance between he lines given by $\vec{r} = (2\hat{j} - 3\hat{k}) + \lambda(2\hat{i} - \hat{j})$, and $\vec{r} = (4\hat{i} + 3\hat{k}) + \mu(3\hat{i} + \hat{j} + \hat{k})$.

Q.29 An open a box with a square base is to be made out of a given quantity of sheet of area a^2. Show that the maximum volume of the box is $\frac{a^3}{6\sqrt{3}}$.

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