Sample Paper – 2014
Class – XII
Subject – Mathematics (Code No. 041)
M.M. 100

Time : 3 hours

General Instructions:

(I). All questions are compulsory

(II). The question paper consists of 29 questions divided into three section A comprises of 10 questions of one mark each, section B comprises of 12 questions of four marks each and section C. comprises of 07 questions of six marks each.

(III). All questions in section A are to be answered in one word, one sentence or as per the exact requirement of the question.

(IV). There is no overall choice. However Internal choice has been in 04 questions of four marks each and 02 questions of six marks each .You have to attempt only one of the alternative in all such questions.

(V). Use of calculator is not permitted. However, you may ask for logarithmic and statistical Tables, **if** *required.*

Section – A

Q.01 Show that the function $f: R \to R$ given by $f(x) = x^3 + x$ is a bijective.

Q.02 Solve for x : $\tan^{-1}\frac{1-x}{1+x} = \frac{1}{2}\tan^{-1}(x), x > 0,$

Q.03 If $\begin{bmatrix} 9 & -1 & 4 \\ -2 & 1 & 3 \end{bmatrix} = A + \begin{bmatrix} 1 & 2 & -1 \\ 0 & 4 & 9 \end{bmatrix}$, then find the matrix A.

Q.04 for what value of *a*, $\begin{bmatrix} 2a & -1 \\ -8 & 3 \end{bmatrix}$ is a singular matrix ?

Q.05 A square matrix A, of order 3, has $|A| = 5, find\ |A.adjA|.$

Q.06 Evaluate $\int e^x \left[\frac{1}{x} - \frac{1}{x^2}\right] dx.$

Q.07 Write the value of $\int e^{4\log x}(x^5)\,dx$.

Q.08 If $\vec{a} = 5\hat{\imath} - 4\hat{\jmath} + \hat{k}$, $\vec{b} = -4\hat{\imath} + 3\hat{\jmath} - 2\hat{k}$ and $\vec{c} = \hat{\imath} - 2\hat{\jmath} - 7\hat{k}$, then find $\vec{c}.(\vec{a} \times \vec{b})$.

Q.09 Find the value of λ such that the line $\frac{x-2}{12} = \frac{y-1}{\lambda} = \frac{z-3}{-8}$ is perpendicular to the plane

3x – y – 2z = 7.

Q.10 If $\vec{a}$ is a unit vector and $(\vec{x} - \vec{a}).(\vec{x} + \vec{a}) = 24$, then write the value of $|\vec{x}|$.

P. T. O.

Section – B

Q.11 Let A = $N \times N$ *and* $*$ be the binary operation on A defined by $(a, b) * (c, d) = (a + c, \quad b + d)$, show that $*$ is commutative and associative, Find the identity elements for $*$ on A, if any

Q.12 Solve the equation $\sin[2\cos^{-1}\{\cot(2\tan^{-1}x)\}] = 0.$

OR

Solve for **x:** $sin^{-1}(1-x) - 2\,sin^{-1}x = \frac{\pi}{2}$.

Q.13 Using properties of determinants, prove that:

$$\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ca & cb & c^2+1 \end{vmatrix} = (1 + a^2 + b^2 + c^2)$$

Q.14 For what values of a and b, the function f defined as :

$$f(x) = \begin{cases} 3ax + b, & if < 1 \\ 11, & if\ x = 1 \\ 5ax - 2b, & if\ x > 1 \end{cases} \quad is\ continuous\ at\ x = 1.$$

Q.15 If $x^y + y^x = a^b$, *find* $\frac{dy}{dx}$.

OR

If x = a (cost + sint) and y = b (sint – $t^{\cos t}$), find $\frac{d^2y}{dx^2}$.

Q.16 Find the intervals in which the function given by

$$f(x) = \sin x + \cos x, \quad 0 \le x \le 2\pi$$ is

(a) Increasing , *(b)* decreasing

OR

For the curve y = $4x^3$ - $2x^5$, $find$ all points at which the tangent passes through origin.

Q.17 Evaluate: $\int_0^{2\pi} \frac{dx}{1 + e^{\sin x}}$.

OR

Evaluate the integral $\int_0^{\pi/2} \frac{x \sin x \cos x}{\sin^4 x + \cos^4 x} dx.$

P. T. O.

Q.18 Form the differential equation of the family of circles in the second quadrant and Touching the coordinate axes.

Q.19 Solve the differential equation :

$$\left(\frac{e^{-2\sqrt{x}}}{\sqrt{x}} - \frac{y}{\sqrt{x}}\right)\frac{dx}{dy} = 1, x \neq 0;$$ when x = 0, y = 1,

Q.20 Let $\vec{a} = \hat{i} - \hat{j}$, $\vec{b} = 3\hat{j} - \hat{k}$ and $\vec{c} = 7\hat{i} - \hat{k}$. Find the vector $\vec{d}$ which is perpendicular

To both $\vec{a}$ and $\vec{b}$ and $\vec{c}.\vec{d}$ = 1.

Q.21 Find the distance from the point (3, 4, 5) to the point, where the line

$\frac{x-3}{1} = \frac{y-4}{2} = \frac{z-5}{2}$ meets the plane x + y + z = 2.

Q.22 A and B throw a die alternately till one of them gets a '6' and wins the games. Find

Their respective probabilities of winning if A starts the game.

OR

Three balls are drawn one by one without replacement from a bag containing 5 white and 4 green balls. Find the probability distribution of number of green balls drawn.

Section – C

Q.23 Using elementary transformation, find the inverse of the matrix, if exits

$$\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$$

OR

If $= \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$, find A^{-1} and hence solve the following system of equations:

$x + y + 2z = 0;$
$x - 2y - z = 9;$
$x - 3y + 3z = -14.$

Q.24 Show that the semi- vertical angle of right circular cone of given surface area and

Maximum volume is $\sin^{-1}\frac{1}{3}$.

OR

P. T. O.

A letter is known to have come either from LONDON or CLIFTON. On the envelop just two consecutive letter ON are visible. What is the probability that letter has come from
(1) LONDON ? (ii) CLIFTON ?

Q.25 Evaluate $\int_1^3 (x^2 - x + 1)dx$ using integral as the limit of sums.

Q.26 Find the area lying above x- axis and included between the circles $x^2 + y^2 = 8x$ and the Parabola $y^2 = 4x$.

Q.27 Find the distance of the point (-2, 3, -4) from the line $\frac{x+2}{3} = \frac{2y+3}{4} = \frac{3z+4}{5}$ measured

Parallel to the plane $4x + 12y - 3z + 1 = 0$.

Q.28 An urn contains five balls. Two balls are drawn and are found to be white. What is the

Probability that all the balls are white?

Q.29 A small firm manufactures gold rings and chains. The total number of rings and chains Manufactured per day is atmost 24. It takes 1 hour to make a ring and 30 minutes to make a chain. The maximum numbers of hours available per day is 16. If a profit on a ring is Rs. 300 and that on a chain is Rs. 190, find the number of rings and chains that should be Manufactured per day, so as to earn the maximum profit. Make it as an L.P.P. and solve it Graphically.

Paper Submitted by:

Name **ATAL BIHARI GUPTA**
Email **atalbg1@gmail.com**
Phone No. **9450430500**