Sample Paper- 2015
MATHEMATICS
Class-XII

Time : 3 hours **M.M.100**

General Instructions:

(1). All questions are compulsory

(2). 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.

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

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

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

Section–A

Q. 1 A matrix A of order 3× 3 has determinant 5. What is the value of $|3A|$?

Q. 2For what value of x, the following matrix is singular ?

$$\begin{bmatrix} 5-x & x+1 \\ 2 & 4 \end{bmatrix}$$

Q. 3 Evaluate the determinants.

$$\begin{vmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{vmatrix}$$

Q. 4 What is the principal value of

$\cos^{-1}\left(\cos\frac{2\pi}{3}\right) + \sin^{-1}\left(\sin\frac{2\pi}{3}\right)$?

Q.5 Give an example of a relation which is reflexive and transitive but not Symmetric;

Q.6The radius of a circleis increasing at the rate of 0.7 cm/s. what is the rate of increasingof its circumference ?

Q.7 Evaluate; $\int \tan^2\frac{x}{2}\, dx$.

Q.8 Find the projection of the vector $\vec{a} = 2\hat{\imath} + 3\hat{\jmath} + 2\hat{k}$, on the vector $\vec{b} = \hat{\imath} + 2\hat{\jmath} + \hat{k}$.

Q.9 Find $|\vec{x}|$if for a unit vector $\vec{a}$, $(\vec{x} - \vec{a})(\vec{x} + \vec{a}) = 12$.

Q.10 Show that the points (2,3,4), (-1,-2,1),(5,8,7) are collinear.

SECTION–B

Q.11 Write the function in the simplest form $\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$, x$< \pi$

Q12 Show that the function f(x) = $|x+2|$ is the continuous at every x ϵ *R* but fails to be differentiable at x = -2.

Q.13 Using properties of determinants, prove that

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

Q.14 *Find the value of a and b such that the function defind by*

$$f(x) = \begin{cases} 5 & \text{if } x \le 2 \\ ax+b & \text{if } 2 < x < 10 \\ 21 & \text{if } x \ge 10 \end{cases} \text{ is a continous function}$$

Q. 15 *If* $(x-a)^2+(y-b)^2=c^2$, *for* $c>0$, *prove that* $\dfrac{\left[1+\left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}$ is constant t independent of a and b.

Q.16 Find the equation of the tangent line to the curve $y = x^2-2x+7$ is parallel to the line $2x - y + 9 = 0$.

Q 17 Evaluate $\int \frac{e^x}{\sqrt{5-4e^x-e^{2x}}}dx$

OR

Evaluate $\int (\sqrt{\cot x} + \sqrt{\tan x}\,)\,dx$

Q.18 Evaluate $\int_0^{\frac{\pi}{2}} \frac{x+\sin x}{1+\cos x}\,dx.$

OR

Find $\int_1^2 \frac{x\,dx}{(x+1)(x+2)}$

Q.19 Evaluate $\int_0^1 (3x^2+2x+1)\,dx$.as the limit of the sum.

Q.20 Find the area of the parallelogram whose adjacent sides are represented by the vectors $3\hat{i}+\hat{j}-2\hat{k}$ and $\hat{i}-3\hat{j}+4\hat{k}$.

Q.21 Find the shortest distance between the lines, whose equations are

$$\frac{x-8}{3} = \frac{y+9}{-16} = \frac{10-z}{-7} \text{ and } \frac{x-5}{3} = \frac{58-2y}{-16} = \frac{z-5}{-5}$$

OR

Prove that the image of the point (3,-2,1) in the plane 3x – y + 4z = 2 lies on the plane, x + y + z + 4=0 .

Q .22 There are 5% defective items in a large bulk of items. What is theProbability that a sample of 10 items will include not more than onedefective items ?

SECTION-C

23 Using elementary transformation find the inverse of the matrix $\begin{bmatrix} 1 & 3 & -2 \\ -3 & 0 & -5 \\ 2 & 5 & 0 \end{bmatrix}$

OR

Consider f : R→ $[-5, \infty)$ given by f(x) = 9x2+6x-5. Show that f isInvertible. Find the inverse of f.

Q.24 A point on the hypotenuse of a triangle is at distance *a* and *b* from the Sides of thetriangle.

Show that the minimum length of the hypotenuse is $\left(a^{2/3} + b^{2/3}\right)^{3/2}$.

Q.25 Find the area of the region bounded by the curve $y = x^2+2$, and the lines y =x, x = 0and x = 3.

Q.26 Solve the differential equation

$(\tan^{-1}y - x)dy = (1 + y^2)\, dx$.

Q.27 Find the vector equation of the line passing through the (1,2,3) and parallelto the planes $\vec{r}.(\hat{i} - \hat{j} + 2\hat{k}) = 5$ and $\vec{r}.(3\hat{i} + \hat{j} + \hat{k}) = 6$.

OR

Find the distance of the point (-1,-5,-10) from the point of intersection of the line $\vec{r} = 2i - j + 2k + \lambda(3i + 4j + 2k)$ *and the plane* $r.(i - j + k) = 5$

Q.28 Two godowns A and B have grain capacity of 100 quintals and 50 quintal respectively.They supply to 3 ration shops, D,E and F whose requirementsAre 60,50 and 40 quintals respectively. The cost of Transportation per quintal from the godowns to the shops are given in the following table ;

Transportation cost per quintal (in Rs)		
From/To	A	B
D	6	4
E	3	2
F	2.50	3

How should the supplies be transported in order that the Transportation cost is minimum ? what is the minimum cost?

Q.29 A factory has two machines A and B. past record shows that machineA produced 60% of the items of output and machine B produced 40% Of the items. Further, 2% of the items produced by the machine A and 1% produced by the machine B were defective.

All the items are put into One stockpile and then one item is chosenat random from this and is Found to be defective. What is the probability that it wasproduced by machine B?