ACADEMY OF SCIENCE, BILASPUR , CHHATTISGARH (IIT,CPMT,AIEEE, STATE PET,PMT COACHING INSTITUTE) Contact no.-0971328199,0826819224
CLASS-XII
GUESS PAPER
MATHEMATICS

Time-3 hr.   **Marks-100**

General Instructions:

(i)   **All questions are compulsory.**

(ii)   **The question paper consists of 29 questions divided into four sections A,B,C and section A comprises of 10 questions of 01 mark each, Section B comprises of 12 questions of 04 marks each and Section C comprises of 07 questions of 6 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 provided in 04 questions of 4 marks each and 02 questions of 6 marks each. You have to attempt only one of the alternatives in all such questions .**

(v)   **Use of calculators is not permitted. You may ask for logarithmic tables, if required.**

Q.1 Show that the function f:R->R defined as f(x) = 3x+4 is one-one and onto .

Q.2 Write the principal value of
$\tan^{-1}(1) + \cos^{-1}(-1/2) + \sin^{-1}(-1/2)$

Q.3 If

$A = \begin{bmatrix} \text{Cos}\alpha & -\sin\alpha \\ \text{Sin}\alpha & \cos\alpha \end{bmatrix}$ Then A + A' =I , if the value of α is given by ?

Q.4 Given a matrix

$$A=\begin{bmatrix} 3 & -2 \\ 5 & 6 \end{bmatrix}$$ Find matrix kA where k=-3

Q.5 Find the point where the line y=x +1 is a tangent to the curve $y^2= 4x$.

Q.6 Find the angle between the vectors i-2j +3k and 3i-2j+k.

Q.7 The Cartesian equation of a line is
(x-5)/3 =(y+4)/7 =(z-6)/2 write its vector form.

Q.8 Write the value of $\int$ $(sin^2x – cos^2x)/ sin^2x .cos^2x$ dx

Q.9 Find a vector in the direction of 5i –j+2k which has magnitude 8 units.
Q.10 Let A be a non singular square matrix of order 3x3. Then $\left| adj\ A \right|$ is equal to ?

SECTION-B

Q.11 Let f:N⟶R be a function defined as f(x)=$4x^2$ + 12x +15 . Show that f:N ⟶ S, where S
is the range of f, is invertible .Find the inverse of f.   **OR**
Let A=NxN and * be a binary operation on A defined by (a,b) * (c,d) = (a+c, b+d). Show that *
is commutative and associative. Find the identity element for * on A, if any.

Q.12 Prove that
$tan^{-1}(63/16)$ =$sin^{-1}(5/13)$ + $cos^{-1}(3/5)$

Q.13 By using elementary operations, find the inverse of the matrix

$$A=\begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$$ OR
If x,y,z are different and
$$\Delta=\begin{bmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{bmatrix}$$ =0 then show that 1+xyz=0

Q.14 Discuss the continuity of the cosine, cosecant, secant and cotangent functions.

Q.15 If y= $(x)^{sinx}$ + $(sinx)^x$, Find dy/dx.   **OR**
Differentiate

$\tan^{-1}\{(\sqrt{1+x^2} - \sqrt{1-x^2})/(\sqrt{1+x^2} + \sqrt{1-x^2})\}$ with respect to $\sin^{-1}[2x/1+x^2]$

Q.16 Evaluate : $\int \sqrt{tan\theta}\ d\theta$

Q.17 Water is leaking from a conical funnel at the rate of 5 cm³/sec. If the radius of the base of funnel is 5 cm and height 10 cm, find the rate at which is the water level is dropping when it is 2.5 cm from the top.

Q.18 Evaluate $\int_0^2 (x^2 + x + 2)dx\ as\ limit\ of\ sums.$

Q.19 Evaluate : $\int_0^{\pi/2} \frac{x sinx\ cosx}{sin^4x + cos^4x}\ dx$

Q.20 Find the coordinates of the foot of the perpendicular drawn from the point A(1,8,4) to the line joining the points B(0,-1,3) and C(2,-3,-1).

Q.21 Express the vector $\vec{a}$ = 5i-2j+5k as sum of two vectors such that one is parallel to the vector $\vec{b}$ = 3i +k and the other is perpendicular to $\vec{b}$

Q.22 A factory has 3 machines X, Y and Z producing 1000, 2000 and 3000 bolts per day respectively. The machine X produces 1% defective bolts, Y produces 1.5% and Z produces 2% defective bolts. At the end of a day, a bolt is drawn at random and is found defective. What is the probability that this defective bolt has been produced by the machine X ? **OR**
A bag contains 6 red and 5 blue and another bag contains 5 red and 8 blue balls. A ball is drawn from the first bag and without noticing its colour is put in the second bag. A ball is then drawn from the second bag. Find the probability that the ball drawn is blue in colour.

SECTION-C
Q.23 Find the matrix A satisfying the matrix equation

$$\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

OR
Using matrices, solve the following system of equations :
2x+ y -3z =13
x+y-z =6
2x-y+4z =-12

Q.24 A rectangle is inscribed in a semicircle of radius r with ones of its sides on diameter of semicircle. Find the dimensions of the rectangle so that its area is maximum. Find the area also.
OR

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Show that the height of cylinder of maximum volume that can be inscribed in sphere of radius r is $\frac{2r}{\sqrt{3}}$.

Q.25 Find the area of the following region :

$\{(x,y) : x^2 + y^2 \leq 2ax , y^2 \geq ax, x \geq 0, y \geq 0 \}$ **OR**

Find the area of the region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the line $\frac{x}{a} + \frac{y}{b} = 1$

Q.26 Solve the following differential equation :

$2xydx + (x^2 + 2y^2) dy = 0$

Q.27 Find the Cartesian as well as the vector equation of the passing through the intersection of the planes $\vec{r}. (2i+6j)+12=0$ and $\vec{r}.(3i-j+4k)=0$ which are at unit distance from origin.

Q.28 A random variable X has the following probability distribution values of X

X =	0	1	2	3	4	5	6	7
P(X)=	0	K	2K	2K	3K	K^2	$2K^2$	$7K^2$+K

Find each of the following :

   (i)   K

   (ii)   P(X<6)

   (iii)   P(X$\geq$ 6)

   (iv)   P(0<X<5)

Q.29 A retired person has Rs. 70,000 to invest and two types of bonds are available in the market for investment .First type of bonds yields an annual income of 8% on the amount invested and the second type of bonds yields 10% per annum. As per norms, he has to invest a minimum of Rs. 10,000 in the first type and not more than Rs. 30,000 in the second type. How should he plan his investment , so as to get maximum return, after one year of investment ?

<div align="center">OR</div>

A firm manufacturers two types of products A and B sells them at a profit of 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; wheras one unit of type B requires one minute of processing time on M_1 and one minute on M_2. Machines M_1 and M_2 are respectively available for almost 5 hours and 6 hours in a day. Find out how many units of each type of product should the firm produce a day in order to maximize the profit. Solve the problem graphically.

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