Sample paper Maths (CBSE -12)

Time: 3 hrs **Total Marks: 100**

General Instructions:

1. All questions are compulsory.
2. Please check that this question paper contains 26 questions.
3. Question 1 – 6 in Section A are very short – answer type questions carrying 1 mark each.
4. Questions 7 – 19 in Section B are long – answer I type question carrying 4 marks each.
5. Questions 20 – 26 in Section C are long – answer II type question carrying 6 marks each.
6. Please write down the serial number of the question before attempting it.

SECTION – A

1. Write the value of $\int_{-1}^{1} x^{17}\, cos^4 x\, dx$. [1]
2. What is the angle between vectors $\vec{a}$ and $\vec{b}$ with magnitude $\sqrt{3}$ and 2 respectively Given? $\vec{a}.\vec{b} = 3$. [1]
3. Find the values of x, y and z from the following equation:
$$\begin{bmatrix} x+y & 2 \\ 5+z & x-y \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 2 \end{bmatrix}$$ [1]
4. If the equation of a line AB is $\frac{x-3}{1} = \frac{y+2}{-2} = \frac{z-5}{4}$, find the direction ratios of a line parallel to AB. [1]
5. What is the principal value of $\cos^{-1}\left(\cos\frac{2\pi}{3}\right) + \sin^{-1}\left(\sin\frac{2\pi}{3}\right)$? [1]
6. Write the value of $\int_{-2}^{1} \frac{|x|}{x} dx$. [1]

SECTION – B

7. Show that $\sin^{-1}\frac{3}{5} - \sin^{-1}\frac{8}{17} = \cos^{-1}\frac{84}{85}$. [4]
8. Find the general solution of the differential equation
$$\frac{dy}{dx} + \frac{y}{x} = x^2$$ [4]
9. Sand is pouring from a pipe at the rate of $12cm^3/s$.The falling sand forms a cone on the ground in such a way that the height of the cone is always one-sixth of the radius of the cone.How fast is the height of the sand-cone increasing when the height is 4 cm? [4]
10. There are 5% of defective items in a large bulk of items. What is the probability that a sample of 10 items will include not more than 1 defective item? [4]
11. Using properties of determinants,prove the following:
$$\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix} = 2(a+b+c)^3$$

OR

Using properties of determinants, Evaluate:

$$\begin{vmatrix} x & y & x+y \\ y & x+y & x \\ x+y & x & y \end{vmatrix}.$$ [4]

12. Evaluate : $\int \frac{tan^4\sqrt{x}sec^2\sqrt{x}}{\sqrt{x}}dx.$ [4]
13. Let * be the binary operations on N given by a*b=L.C.M OF a and b. Find
    i)Is * commutative? ii) Is * associative? iii) Find the identity element of * in N. [4]
14. By using elementary operations, Find the inverse of the matrix A=$\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$. [4]
15. Show that:$\int_0^{\pi/2} \frac{dx}{3+2sinx+cosx} = \tan^{-1} 2 - \frac{\pi}{4}$. [4]
16. A point source of light along a straight road is at a height of 'a' meters. A boy 'b' meters in height is walking along the road .How fast is his shadow increasing if he is walking away from the light at the rate 'c' meters per minute? [4]
17. Find the area of the triangle with vertices $A(1,1,2)$, $B(2,3,5)$ and$C(1,5,5)$.

    OR

    If $\hat{a} \times \hat{b} = \hat{c} \times \hat{d}$, $\hat{a} \times \hat{c} = \hat{b} \times \hat{d}$, Show that $\hat{a} - \hat{d}$ is parallel to $\hat{b} - \hat{c}$. [4]
18. Using differentials, find the approximate value of $(0.009)^{1/3}$. [4]
19. If $y = e^x \tan^{-1} x$,then show that $(1 + x^2)\frac{d^2y}{dx^2} - 2(1 - x + x^2)\frac{dy}{dx} + (1 - x^2)y = 0$ [4]

SECTION – C

20. For the matrix A=$\begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{pmatrix}$.Show that $A^3 - 6A^2 + 5A + 11I = 0$.Hence find A^{-1}. [6]
21. Find the equation of the plane which contains the two parallel lines $\frac{x-3}{3} = \frac{y+4}{2} = \frac{z-1}{1}$ and $\frac{x+1}{3} = \frac{y-2}{2} = \frac{z}{1}$. [6]
22. A and B throw a pair of die turn by turn. The first to throw 9 is awarded a prize. If A starts the game, show that the probability of A getting the prize is$\frac{9}{17}$. [6]
23. Find the area of the smaller region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the line $\frac{x}{a} + \frac{y}{b} = 1$. [6]
24. Sketch the graph of $y = |x + 3|$ and evaluate $\int_{-6}^{0} |x + 3|\, dx$.What does this integral represent? [6]
25. Prove that the perimeter of a right-angled triangle of given hypotenuse is maximum when the triangle is isosceles. [6]
26. Find the vector equation of a line passing through the point with position vector$(2\hat{\imath} - 3\hat{\jmath} - 5\hat{k})$ and perpendicular to the plane $\hat{r}.(6\hat{\imath} - 3\hat{\jmath} - 5\hat{k}) + 2 = 0$. [6]