

MATHEMATICS PAPER IB.- MAY 2010.

COORDINATE GEOMETRY (2D&3D & CALCULUS.

TIME : 3hrs

Max. Marks.75

Note: This question paper consists of three sections A,B and C.

SECTION A

VERY SHORT ANSWER TYPE QUESTIONS.

10X2 =20

Noe : Attempt all questions. Each question carries 2 marks.

1. Find the equation of the straight line passing through (-4, 5) and cutting off equal nonzero intercepts on the coordinate axes.
2. Transform the equation $x + y + 1 = 0$ into normal form.
3. Find the ratio in which YZ – plane divides the line joining A (2, 4, 5) and B(3, 5, -4). Also find the point of intersection.
4. Find the equations of the plane passing through the point (1,1,1) and parallel to the plane $x + 2y + 3z - 7 = 0$
5. Find $\lim_{x \rightarrow 0} \left(\frac{\sqrt{1+x} - 1}{x} \right)$
6. Find $\lim_{x \rightarrow \infty} \frac{8|x| + 3x}{3|x| - 2x}$
7. Show that the function $f(x) = \begin{cases} \frac{\sin 2x}{x} & \text{if } x \neq 0 \\ x & \text{if } x = 0 \end{cases}$ continuous at 0 .
8. If $f(x) = x^2 2^x \log x$, find $f^1(x)$
9. Find Δy and dy for the function $y = \log x$ when $x = 3$ and $\Delta x = 0.003$.
10. Find the equation of the normal to the curve $y = 5x^4$ at the point (1, 5)

SECTION B

SHORT ANSWER TYPE QUESTIONS.

5X4 =20

Note : Answer any FIVE questions. Each question carries 4 marks.

11. The ends of the hypotenuse of a right angled triangle are (0, 6) and (6, 0). Find the equation of locus of its third vertex.

12. When the axes are rotated through an angle 45° , the transformed equation of a curve is $17x^2 - 16xy + 17y^2 = 225$. Find the original equation of the curve.
13. If $3a + 2b + 4c = 0$, then show that the equation $ax + by + c = 0$ represents a family of concurrent straight lines and find the point of concurrency.
14. Find the derivatives of the following functions $f(x) = \sin 2x$ from the first principles.
15. If $y = ax^{n+1} + bx^{-n}$ then Prove that $x^2 y' = n(n+1)y$.
16. The radius of a circular plate is increasing in length at 0.01 cm/sec. What is the rate at which the area is increasing, when the radius is 12 cm.
17. Show that for the function $f = \log(x^2 + y^2)$, $f_{xx} + f_{yy} = 0$

SECTION C

LONG ANSWER TYPE QUESTIONS.

5X7 =35

Note: Answer any Five of the following. Each question carries 7 marks.

18. Find the circumcentre of the triangle whose sides are $x + y = 0$, $2x + y + 5 = 0$ and $x - y = 2$.
19. Show that the area of the triangle formed by the lines $ax^2 + 2hxy + by^2 = 0$ and $lx + my + n = 0$ is $\frac{n^2 \sqrt{h^2 - ab}}{|am^2 - 2hlm + bl^2|}$ sq. units.
20. Find the values of k , if the lines joining the origin to the points of intersection of the curve $2x^2 - 2xy + 3y^2 + 2x - y - 1 = 0$ and the line $x + 2y = k$ are mutually perpendicular.
21. show that the angle between the lines whose direction cosines are given by the equations $3l + m + 5n = 0$ and $6mn - 2nl + 5lm = 0$ is $\cos^{-1}\left(\frac{1}{6}\right)$.
22. Find the derivative $\frac{dy}{dx}$ of the function $y = \frac{(1-2x)^{\frac{2}{3}}(1+3x)^{\frac{-3}{4}}}{(1-6x)^{\frac{5}{6}}(1+7x)^{\frac{-6}{7}}}$
23. If the tangent at any point on the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ intersects the coordinate axes in A and B, then show that the length AB is a constant.
24. Show that when the curved surface of right circular cylinder inscribed in a sphere of radius R is maximum, then the height of the cylinder is $\sqrt{2}R$.
