MATHEMATICS PAPER IB.- MARCH 2010.

COORDINATE GEOMETRY(2D &3D) AND CALCULUS.

TIME : 3hrs Max. Marks.75

SECTION A

VERY SHORT ANSWER TYPE QUESTIONS. **10X2 =20**

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

1. Find the condition for the points $(a, 0)$, (h, k) and $(0, b)$ where $ab \neq 0$ to be collinear.

2. Find k, if the straight lines $y - 3kx + 4 = 0$, $(2k - 1)x - (8k - 1)y - 6 = 0$ are perpendicular.

3. Find the ratio in which the point C(6,-17,-4) divides the line segment joining the points A(2,3,4) and B(3,-2,2).

4. Find the equations of the plane whose intercepts on X,Y,Z axes are respectively 1,2,4.

5. Compute $\underset{x\to 0}{\text{lt}} \dfrac{1-\cos 2mx}{\sin^2 nx} (m, n \in z) = 2\left(\dfrac{m}{n}\right)^2$

6. Compute $\lim\limits_{x\to\infty} (\sqrt{x^2+1} - x)$

7. Find the value of ‘a’ so that $f(x) = \begin{cases} ax+3 \text{ if } x<3 \\ 3-x+2x^2 \text{ if } x \geq 3 \end{cases}$ is continuous on R.

8. Find the derivative of $\log(\sin^{-1} e^x)$

9. if $y = e^x$, when $x = 0$ and $\delta x = 0.1$ then find Δy and Δx.

10. Show that at any point p(x,y) on the curve $y = be^{x/a}$, the length of subtangent is a constant.

SECTION B

SHORT ANSWER TYPE QUESTIONS. **5X4 =20**

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

11. Find the equation of locus of a point, the sum of whose distances from (0,2) and (0,-2) is 6 units.

12. When the origin is shifted to the point (2,3), the transformed equation of a curve is $x^2 + 3xy - 2y^2 + 17x - 7y - 11 = 0$. Find the original equation of the curve.

13. find the equation of the line perpendicular to the line 3x+4y+6 =0 and making an intercept -4 on the X-axis.

14. find the derivative of xsinx from the first principle.

15. If $x = 3\cos t - 2\cos^3 t$, $y = 3\sin t - 2\sin^3 t$ then find $\dfrac{dy}{dx}$.

16. Show that the curves $4x^2+8y^2=3$ and $6x^2-5xy+2y=0$ touch each other at p $\left(\frac{1}{2},\frac{1}{2}\right)$

17. If $u = Sin^{-1}\left(\sqrt{x}+\sqrt{y}\right)$, then $xu_x + yu_y = \frac{1}{2}$ tan u

SECTION C

LONG ANSWER TYPE QUESTIONS. **5X7 =35**

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

18. Find the orthocentre of the triangle formed by the lines $x + 2y = 0$, $4x + 3y - 5 = 0$ and $3x + y = 0$.

19. If $\boldsymbol{S \equiv ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0}$ represents a pair of parallel lines then prove that $\boldsymbol{h^2 = ab}$ and $\boldsymbol{bg^2 = af^2}$. Also the distance between the two parallel

lines is $\boldsymbol{2\sqrt{\frac{g^2 - ac}{a(a+b)}}}$.

20. If the staraight lines joining the origin to the points of intersection of the curve $3x^2 - xy + 3y^2 + 2x - 3y + 4 = 0$ and the line $2x+3y=k$ are perpendicular, prove that $6k^2 - 5k+52 = 0$

21. Find the angle between the lines whose direction cosines are given by the equations $3l + m + 5n = 0$ and $6mn - 2nl + 5lm = 0$

22. If $y = Tan^{-1}\left[\frac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right]$ for $0 < |x| < 1$ find $\frac{dy}{dx}$.

23. If the tangent at any point P on the curve $x^m y^n = a^{m+n}\ (mn \neq 0)$ meets the coordinate axes in A,B, then show that AP : BP is a constant.

24. Find the rectangle of maximum perimeter that can be inscribed in a circle

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