MATHEMATICS PAPER IB.- MAY, 2009.
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 (2, 3) and making non-zero intercepts on the co ordinate axes whose sum is zero.
2. If θ is the angle between the straight lines $\frac{x}{a}+\frac{y}{b}=1$ and $\frac{x}{b}+\frac{y}{a}=1$, find the value of Sin θ.
3. For what value of t, the points (2, -1, 3), (3, -5, t) and (-1, 11, 9) are collinear?
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 $\lim_{x \to 0} \frac{\sin(a+bx)-\sin(a-bx)}{x}$
6. Find $\lim_{x \to \infty} \frac{8|x|+3x}{3|x|-2x}$
7. Examine the continuity of f(x) =[x] +x at the point x=2.
8. If $y=(\cot^{-1}x^3)^2$ then find $\frac{dy}{dx}$.
9. Find an approximate value of $\sqrt{82}$
10. Show that the length of the subnormal at any point on the curve $y^2=4ax$ is a constant.

SECTION B

SHORT ANSWER TYPE QUESTIONS. **5 × 4 = 20**
Note : Answer any FIVE questions. Each question carries 4 marks.

11. A (1, 2), B (2, -3) and C (-2, 3) are three points. A point P moves such that $PA^2+PB^2=2PC^2$. Find the locus of P.
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 equations of the straight lines passing through the point of intersection of the lines 3x + 2y + 4 = 0, 2x + 5y = 1 and whose distance from (2, -1) is 2.

14. Find the derivatives of the function $f(x) =$ x sinx from the first principles.

15. Differentiate $f(x) = Tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ with respect to $g(x) = Tan^{-1}x$

16. Sand is poured from a pipe at the rate of 12 cc./ sec. 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 base. How fast is the height of the sand – cone increasing when the height is 4 cm.

17. If $u^2 = \frac{1}{x^2+y^2+z^2}$, show that $\sum \frac{\partial^2 u}{\partial x^2} = 0$

SECTION C

LONG ANSWER TYPE QUESTIONS. **$5 \times 7 = 35$**

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

18. If the equations of the sides of a triangle are 7x +y -10 =0, x-2y+5= 0 and x + y +2=0. Find the orthocentre of the triangle.

19. If the equation $ax^2 + 2hxy + by^2 = 0$ represents a pair of distinct (i.e., intersecting) lines, then the combined equation of the pair of bisectors of the angle between these lines is $h(x^2 - y^2) = (a-b)xy$

20. If the equation $mx^2 - 10xy + 12y^2 + 5x - 16y - 3 = 0$ represents a pair of straight lines find m also find the coordinates of the point of intersection of the lines for this value of m.

21. Find the direction cosines of two lines which are connected by the relations $l - 5m + 3n = 0$ and $7l^2 + 5m^2 - 3n^2 = 0$.

22. If a > b>0 and $0 < x < \pi$; $f(x) = (a^2 - b^2)^{-\frac{1}{2}} \cos^{-1}\left(\frac{a\cos x + b}{a + b\cos x}\right)$ then show that

$$f^1(x) = \frac{1}{a + b\cos x}.$$

23. Find the angle between the curves $2\,2y^2 - 9x = 0; 3x^2 + 4y = 0$ in 4^{th} quadrant.

24. A window is in the shape of a rectangle surmounted by a semi-circle. If the perimeter of the window be 20 ft., find the maximum area of the window.

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