MATHEMATICS PAPER IB.- JUNE 2008
COORDINATE GEOMETRY & 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. Find the foot of the perpendicular drawn from (4, 1) upon the straight line 3x – 4y + 12 = 0
3. Find the centroid of the tetrahedron with the vertices (3,2,-4)(5,4,-6) (9,8,-10)(3,4,10)
4. Find the distance of the point from the plane 6x-3y+2z-14 =0
5. show that $\lim_{x \to 2} \left(\frac{2|x|}{x} + x + 1 \right) = 3$
6. compute $\lim_{x\to 0} \frac{\sqrt[3]{1+x} - 1}{x}$
7. check the continuity of the following function at 2.

$$F(x) = \begin{cases} \frac{1}{2}(x^2 - 1), & 0 < x < 2 \\ 0, & x = 2 \\ 2 - 8x^{-3}, & x > 2 \end{cases}$$

8. Find the derivative of the function f(x) = $a^2.e^{x^2}$
9. Find Δy and dy if $y = \frac{1}{x}$ when x = 2, $\Delta x = 0.002$
10. Find the interval in which f(x) = $-3+12x-9x^2+2x^3$ is increasing and decreasing.

SECTION B

SHORT ANSWER TYPE QUESTIONS. 5 × 4 =20

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

11. Find the equation of locus of P, if the ratio of the distance from P to (5, -4) and (7,6) is 2 :3.
12. When the axes are rotated through an angle p/4, find the transformed equation of $3x^2 + 10xy + 3y^2 = 9$.
13. Transform the equation $\frac{x}{a} + \frac{y}{b} = 1$ into the normal form when a > 0 and b >0. If the perpendicular distance of straight line from the origin is p, deduce that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$
14. Find the derivatives of the $\cos^2 x$ function $f(x)$ from the first principles.
15. Find $\frac{dy}{dx}$ for the function $x = a(\cos t + t\sin t),\ y = a(\sin t - t\cos t)$

16. A point P is moving on the curve y = $2x^2$. The x co-ordinate of P is increasing at the rate of 4 units per second. Find the rate at which the y co-ordinate is increasing when the point is at (2, 8).

17. If $u = Tan^{-1}\left(\frac{x^3 - y^3}{x^3 + y^3}\right)$ then show that $xu_x + yu_y = 0$ using Euler's theore.

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-2y+5= 0 , x + y +2=0and 5x - y -2 = 0.

19. Show that the product of the perpendicular distances from a point (α, β) to the pair of straight lines $ax^2 + 2hxy + by^2 = 0$ is $\frac{|a\alpha^2 + 2h\alpha\beta + b\beta^2|}{\sqrt{(a-b)^2 + 4h^2}}$.

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

21. If a ray makes angle $\alpha, \beta, \gamma, \delta$ with the four diagonals of a cube, show that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta = \frac{4}{3}$

22. If $y = x\sqrt{a^2 + x^2} + a^2\log\left(x + \sqrt{a^2 + x^2}\right)$ then show that $\frac{dy}{dx} = 2\sqrt{a^2 + x^2}$

23. If the tangent at any point P on the curve $x^m y^n = a^{m+n}$ (mn0) meets the coordinate axes in A and B then show that AP : BP is a constant.

24. Show that the area of a rectanlge inscribed in a circle is maximum when it is a square.

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