

**MATHEMATICS PAPER IB.- MAY 2011.**  
**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 line passing through A(-1,3) and perpendicular to the straight line passing through B(2,-5) and C(4,6)
2. If area of the triangle formed by lines  $x = 0$ ,  $y = 0$  and  $3x + 4y = a$  is 6 sq units . Find 'a'
3. If (3,2,-1) (4,1,1) and (6,2,5) are three vertices and (4,2,2) is centroid of tetrahedron find fourth vertex
4. Find equation of plane passing through point (1,1,1) and parallel to the plane  $x+2y+3z-7=0$
5. Is the function  $f$  is defined by  $f(x) = \begin{cases} x^2 & \text{if } x \leq 1 \\ x & \text{if } x > 1 \end{cases}$  continuous on R
6. If  $\log(\sec x + \tan x)$  find  $f'(x)$
7. Find the derivative of  $\sin^{-1}(3x-4x^3)$
8. If  $x = a \cos^3 t$   $y = a \sin^3 t$  find  $dy/dx$
9. If an error of 3% occurs in measuring the side of cube find percentage error in its volume.
10. Show that the length of the subtangent at any point on the curve  $y = a^x$  is constant

**SECTION B**

**SHORT ANSWER TYPE QUESTIONS.**

**5X4 =20**

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

11. Find locus of point the difference of whose distance from (-5,0) and (5,0) is 8
12. Find the transformed equation of the curve  $3x^2 + 10xy + 3y^2 = 9$  when the axes are rotated through an angle  $\frac{\pi}{4}$
13. Find the value of k, if the angle between the straight lines  $4x - y + 7 = 0$  and  $kx - 5y - 9 = 0$  is 45

14. Compute  $\lim_{x \rightarrow 0} \left( \frac{\cos ax - \cos bx}{x^2} \right)$

15. Find the derivative of the function  $\tan 2x$  from first principle

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  $u = \tan^{-1} \left( \frac{x^3 + y^3}{x + y} \right)$ ; show that  $xu_x + yu_y = \sin 2u$

## SECTION C

### LONG ANSWER TYPE QUESTIONS.

**5X7 =35**

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

18. Find circum center of triangle whose sides are  $3x-y-5=0$   $x+2y-4=0$  and  $5x+3y+1=0$

19. Show that the product of the perpendicular from a point  $(\alpha, \beta)$  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. Find angle between the lines joining the origin to the points of intersection of curves  $x^2 + 2xy + y^2 + 2x + 2y - 5 = 0$ , and line  $3x-y+1=0$

21. Find the angle between two lines which are non-parallel and whose direction cosines are related by the equations  $l+m+n=0$  and  $l^2 + m^2 - n^2 = 0$

22. If  $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$  then  $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$

23 .a) define the angle between two curves

b) find the angle between the curves  $xy=2$  and  $x^2+4y=0$

24. Show that when the curved surface of a right circular cylinder inscribed in a sphere of radius R is maximum, then the height of the cylinder is  $\sqrt{2}R$ .