## Mathematics - 3

Time - 1 Hour mark - 25.

(a) Final the velocity and position vector of an object with the given acceleration, initial velocity and position,  $a(t) = -32k, \quad v(0) = i+2j, \quad v(0) = 128k$ 

(b) Find the directional derivative of f(x,y) = Jxy at (1,4) in the direction of the unit vector that makes an angle (5) with the positive x-axis.

2. (a) Define curvature of a plane curve

(b) Find the curvature of a circle of nadius a.

(c) Find the circle of curvature (osculating circle) of the parabola  $y=x^2$  at the origin.

3. (a) Define TNB-frame

(b) A particle move's along a curve described by the vector function  $v(t) = ti + t^2j + t^3k$ . Find the tangential scalar components of acceleration and of and normal scalar components of acceleration and of the particle at any time t. Also find the curvature of the particle at any time t.

4 (a) If  $Z = 3x^3y + 4xy^2 - 2x + 4y - 5$ . Find  $\frac{\partial z}{\partial x}$  and  $\frac{\partial z}{\partial y}$ (b) Verify that  $\frac{\partial^2 w}{\partial y \partial x} = \frac{\partial^2 w}{\partial x \partial y}$ ,  $w = x^y + 5in(xy)$  5. (a) Give the formula for divergence and curl of the vector b) compute the divergence and card of the vector, F = ayz i+ 3a24 j + (az2-y2)k at (1,2,-1)

(c) Evaluate \int signal at + or dy where C is given by y=x?, -1\le x \le ?

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