05|11|15

University Roll No . :   ☐☐☐☐☐☐☐☐☐

Second Term Examination , Odd Semester 2015-16
B.Tech. (I Year)- I Semester

Subject:- Mathematics - I   Subject Code:- AHM-1001

Time: 1 ½ Hours   Max. Marks: 20

Section-A

Note: *Attempt All Questions*   1×5=5

Q.1 If $x = r\cos\theta$, $y = r\sin\theta$ then find $\dfrac{\partial(x, y)}{\partial(r,\theta)}$

Q.2 Find the stationary points for the curve $x^2 + y^2 + 6x + 12$

Q.3 Write the formula for radius of curvature when curve is in parametric form i.e $x = f(t)$ and $y = g(t)$.

Q.4 Is x axis forms envelope of family of circles $x^2 + (y - b)^2 = b^2$ where b is parameter. Also support your answer.

Q.5 Check the symmetry of the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$

Section–B

Note: *Attempt Any three Questions*   2×3=6

Q.1 Given that $u = x + y + z$, $v = x^2 + y^2 + z^2$ and $w = xy + yz + zx$

Is u , v and w are functionally related ? if so find the relation between them.   P.T.O

Q.2 Examine the function $f(x, y) = 3x^2 + y^2 + 4xy + x^3$ for its extreme

values .

Q.3 Find the radius of curvature of $y^2 = 2x(3 - x^2)$ at the points where the

tangents are parallel to x-axis.

Q.4 Determine the envelope of family of curves x sin t − y cos t = at where

't' is the parameter.

Section – C

Note: *Attempt Any three Questions*   3×3=9

Q1. If $u^3 + v^3 + w^3 = x + y + z$, $u^2 + v^2 + w^2 = x^3 + y^3 + z^3$ and

$u + v + w = x^2 + y^2 + z^2$.

Then prove that $\dfrac{\partial(u, v, w)}{\partial(x, y, z)} = \dfrac{(x - y)(y - z)(z - x)}{(u - v)(v - w)(w - u)}$.

Q2. Find the minimum distance from the point (3, 4, 12) to the sphere

$x^2 + y^2 + z^2 = 1$ by using Lagrange's method.

Q3. Determine the circle of curvature of the curve $y = x^3 - 6x^2 + 3x + 1$

at (1, -1).

Q4. Trace the curve $y^2(a + x) = x^2(3a - x)$.