Roll No: .....

Total No. of Questions : 09] [Total No. of Pages :02

Paper ID [A0111]

(Please fill this Paper ID in OMR Sheet)

B.Tech. (Sem. - 1st/2nd)

ENGINEERING MATHEMATICS - I (AM - 101)

Time : 03 Hours **Maximum Marks : 60**

Instruction to Candidates:

1) Section - A is **Compulsory**.
2) Attempt any **Five** questions from Section - B & C.
3) Select atleast **Two** questions from Section - B & C .

Section - A

Q1) **[Marks : 2 Each]**

a) Trace the curve $y^2 = x^3$.

b) Using integration, find the perimeter of the curve $x^2 + y^2 = 4$.

c) State Euler's theorem on homogeneous functions.

d) Discuss the extreme values of $z = f(x,y)$.

e) Write the equation of the cone with vertex at the origin and whose guiding curve is; $x^2 + y^2 = 4$, $z = 2$.

f) Evaluate $\int_0^{\pi/2} \sqrt{\tan\theta}\, d\theta$

g) State Integral test for positive term series.

h) Separate the real and imaginary parts of $\tan(x + iy)$.

i) Find the equations of the normal to the surface $z^2 = 4(1 + x^2 + y^2)$ at $(2, 2, 6)$.

j) If Σu_n is a positive term series & is convergent then show that, $\lim_{n\to\infty} u_n = 0$.

Section - B

[Marks : 8 Each]

Q2) If ρ_1 and ρ_2 be the radii of curvature at the ends of a focal chord of the parabola $y^2 = 4ax$ then show that,

$$\rho_1^{-2/3} + \rho_2^{-2/3} = (2a)^{-2/3}$$

Q3) Find the volume of the solid formed by the revolution of $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$ about its base.

Q4) If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, show that, $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$.

Q5) If $u = a^3x^2 + b^3y^2 + c^3z^2$ where $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$, show that the stationary value of u is given by, $x = \frac{\Sigma a}{a}$, $y = \frac{\Sigma a}{b}$, $z = \frac{\Sigma a}{c}$

Section - C

[Marks : 8 Each]

Q6) Find the equation of the right circular cone generated by rotating the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ about the line $\frac{x}{-1} = y = \frac{z}{2}$

Q7) Change the order of integration in, $\int_0^a \int_{mx}^{lx} f(x, y)\, dydx$.

Q8) Discuss the convergence of the series, $\Sigma \frac{2^n - 2}{2^n + 1} x^{n-1}$ $(x > 0)$.

Q9) Sum the series,

$$\sin\alpha + x\sin(\alpha + \beta) + \frac{x^2}{\lfloor 2}\sin(\alpha + 2\beta) + \ldots\ldots\ldots\infty.$$