

Roll No.

Total No. of Questions : 09]

[Total No. of Pages : 02

Paper ID [AM101]

(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)****(10 × 2 = 20)**

- a) Find the radius of curvature of the curve $x^2 + y^2 = a^2$ at (x, y) .
- b) Find mean square value of $f(x) = \sin x$ in the interval $(0, 1)$.
- c) Find df/dt at $t = 0$, where $f(x, y) = x \cos y + e^x \sin y$, $x = t^2 + 1$, $y = t^3 + t$.
- d) Find the approximate value of $(4.05)^{1/2} (7.97)^{1/3}$, using derivatives.
- e) Write the expansion of the Taylor's series $f(x_0 + h, y_0 + k)$ up to second order.
- f) Write the equation of Ellipsoid and draw a rough sketch of it.
- g) Write two applications of double and triple integral each.
- h) State the integral test of convergence of infinite series.
- i) How the convergence of alternating series is checked.
- j) Separate into real and imaginary parts. $\exp\left(5 + \frac{i\pi}{2}\right)$.

Section - B**(Marks: 8 Each)****Q2)** Sketch the graph of the curve $y = x + \frac{1}{x}$.**R-21/2058/****P.T.O.**

Q3) Find centre of gravity of a lamina in the shape of a quadrant of the curve

$$\left(\frac{x}{a}\right)^{2/3} + \left(\frac{y}{b}\right)^{2/3} = 1, \text{ the density being } \rho = kxy, \text{ where } k \text{ is a constant.}$$

Q4) If $f(x, y)$ is a homogeneous function of degree n in x and y and has continuous first and second order partial derivatives, then show that

$$x^2 \frac{\partial^2 f}{\partial x^2} + 2xy \frac{\partial^2 f}{\partial x \partial y} + y^2 \frac{\partial^2 f}{\partial y^2} = n(n-1)f$$

Q5) Using Lagrange's method find the minimum value of $x^2 + y^2 + z^2$ subject to the condition $xyz = a^3$.

Section - C

(Marks: 8 Each)

Q6) Find the equation of the right circular cylinder having for its base the circle $x^2 + y^2 + z^2 = 9, x - y + z = 3$.

Q7) Express $\int_0^1 x^m (1-x^p)^n dx$ in terms of Beta function and hence evaluate the integral $\int_0^1 x^{3/2} (1-\sqrt{x})^{1/2} dx$.

Q8) Find the radius of convergence and circle of convergence of the power series $\sum \frac{(n!)^2 z^n}{(2n)!}$.

Q9) Find the sum of the trigonometric series

$$\sin \alpha + x \sin(\alpha + \beta) + \frac{x^2}{2!} \sin(\alpha + 2\beta) + \dots \infty$$
