Roll No. | | | | | | | | | | | | | **Total No. of Pages :02**

Total No. of Questions : 09

B.Tech. (AI&DS/AI&ML/Block Chain/CE/IOT/CSE/EEE/CS/EE/ECE/FT/IT /ME/CSD/ETE/DS/R&AI/Internet of Things and Cyber Security Including Block chain Technology) (Sem.–1)

ENGINEERING MATHEMATICS-I

Subject Code : BTAM101-23

M.Code : 93796

Date of Examination : 03-06-2025

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION - B & C have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select at least TWO questions from SECTION - B & C.**

SECTION - A

1. Write short notes on :

a) Explain absolute convergence of improper integrals of second kind.

b) Evaluate the triple Integral $\int_0^2 \int_0^2 \int_0^{yz} xyzdxdydz.$

c) Evaluate $\int_0^1 \int_{x^2}^{x} dydx$

d) State homogeneous function.

e) If $f(x, y) = x^2y + xy^3 - 3x + 4y - 6$, find $\frac{\partial f}{\partial x}$

f) Define conditionally convergent series.

g) State Integral Test.

h) Compute $\Gamma\left(-\frac{3}{2}\right)$.

i) Prove symmetry of beta function.

j) State Taylor's theorem.

SECTION - B

2. Show that the function $\int_0^\infty x^{n-1} e^{-x}\, dx$ is convergent if and only if $n > 0$.

3. Test the convergence of $x + \frac{2^2 x^2}{2!} + \frac{3^3 x^3}{3!} + \frac{4^4 x^4}{4!} \ldots\ldots\ldots\ldots \infty$.

4. Discuss the convergence or divergence of the series $\sum \frac{n^p}{(n+1)^q}$.

5. Find the volume of the solid generated by revolving the curve $x = 2t + 3$, $y = 4t^2 - 9$ about the x axis for $2t = -3$ to $2t = 3$.

SECTION-C

6. If $\theta = t^n e^{\frac{-r^2}{4t}}$, find the value of n which will make $\frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2 \frac{\partial \theta}{\partial r}\right) = \frac{\partial \theta}{\partial t}$.

7. If $U = C\,\mathrm{os}\,ec^{-1}\left(\frac{x^{\frac{1}{2}} + y^{\frac{1}{2}}}{x^{\frac{1}{3}} + y^{\frac{1}{3}}}\right)^{\frac{1}{2}}$, Prove that

$$x^2 \frac{\partial^2 U}{\partial y^2} + 2xy \frac{\partial^2 U}{\partial x \partial y} + y^2 \frac{\partial^2 U}{\partial y^2} = \frac{13 + \tan^2 U}{144}$$

8. Find the volume common to the cylinders $x^2 + y^2 = a^2$ and $x^2 + z^2 = a^2$.

9. Evaluate $\iint (x^2 + y^2)\, dx\, dy$ throughout the area enclosed by the curve

$y = 4x$, $x + y = 3$, $y = 0$ and $y = 2$.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.