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

Total No. of Questions : 09

B.Tech.(AI&DS/BlockChain/CE/CSE/AI&ML/CSD/EEE/EE/ECE/FT/IT/ME/ Internet of Things and Cyber Security including Block Chain Technology) (Sem.–1)

ENGINEERING MATHEMATICS-I

Subject Code : BTAM 101-23

M.Code : S93796

Date of Examination: 16-01-2025

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

INSTRUCTIONS TO CANDIDATES :

1. **Section-A is compulsory consisting of TEN questions carrying TWO marks each.**
2. **Each Section-B & C consist of FOUR questions of EIGHT marks.**
3. **Attempt any FIVE questions from Section-B & Section-C, Selecting at least TWO question from each one of the TWO sections.**

SECTION-A

1. Solve the following:

a) Define sequence and series with the help of an example.

b) Prove that the sequence $(-1)^n$ does not converge.

c) Prove that the series $\sum_{n=1}^{\infty} \frac{1}{\lfloor n}$ converges.

d) Find the length of the arc of the parabola $y^2 - 4y + 2x = 0$ that lie in the first quadrant.

e) Test for convergence of integral $\int_1^{\infty} x^n e^{-x} dx$.

f) Define Gamma function.

g) Find first order partial derivative of $u = \frac{x}{y}\tan^{-1}\left(\frac{y}{x}\right)$.

h) Evaluate $\lim_{\substack{x\to 1\\ y\to 1}} \frac{3xy^2}{2x^2+3y^2+4}$.

i) Evaluate $\int_0^1 \int_{x^2}^{2-x} xy\, dy\, dx$.

j) Evaluate $\int_{-1}^{1} \int_{0}^{z} \int_{x-z}^{x+z} x+y+z \; dy\, dx dz$.

SECTION-B

2. Prove that the sequence $\{a_n\}$ where $a_n = \left(8+\frac{1}{n^3}\right)$ is a cauchy sequence and find its limit.

3. Discuss the convergence or divergence of the series $\sum\left(n\log+\frac{2n+1}{2n-1}-1\right)$.

4. Find the volume of the solid obtained by revolving one arc of the cycloid $x = a(\theta + \sin\theta)$ and $y = a(1 + \cos\theta)$ about x-axis.

5. Prove that $\beta(m,n) = \int_0^\infty \frac{x^{m-1}}{(1+x)^{m+n}}\, dx = \int_0^\infty \frac{x^{n-1}}{(1+x)^{m+n}}\, dx; \; m,n>0.$

SECTION-C

6. If $V = x^2\ y-z\ + y^2\ z-x\ + z^2\ x-y\ $, then $\frac{\partial V}{\partial x}+\frac{\partial V}{\partial y}+\frac{\partial V}{\partial z}=0$.

7. Obtain Taylor's expansion for $f(x,y) = e^{xy}$ at (1,1) up to third term.

8. Evaluate $\int_0^1 \int_{3y}^{3} e^{x^2}\, dx\, dy$, by change of order of integration.

9. Find the volume common to the sphere $x^2 + y^2 + z^2 = a^2$ and the cylinder $x^2 + y^2 = ay$.

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