

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (AI & ML/DS)(CE)(CSE)(IT)(CSE and Design) (EE) (ECE)
(EEE)(Robotics & Artificial Intelligence) (Internet of Things and Cyber
Security including Block Chain Technology)(Block
Chain)(ME)(FT)(Sem.-1)

ENGINEERING MATHEMATICS-I

Subject Code : BTAM101/23

M.Code : 93796

Date of Examination : 08-05-2024

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 atleast TWO questions from SECTION - B & C.

SECTION-A

1. Answer briefly :

a) What do you mean by convergent sequence?

b) Prove that the sequence $\left\{ \frac{2n-7}{3n+2} \right\}$ is bounded.

c) Prove that $\sum \left(\frac{n}{n+1} \right)^2$ is divergent.

d) Find the length of the arc of the parabola $2y = x^2$ from $x = a$ to $x = b$.

e) Test for convergence of integral $\int_2^{\infty} \frac{dx}{x \log(\log x)}$.

f) Define Beta function.

g) Find first order partial derivative of $u = \tan^{-1} \frac{x^2 + y^2}{x + y}$.

h) Show that the function $f(x, y) = \frac{xy^2}{x^2 + y^4}$ has no limit as $(x, y) \rightarrow (0, 0)$.

i) Evaluate $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) dy dx$.

j) Evaluate $\int_0^2 \int_1^2 \int_0^{yz} x y z dx dy dz$.

SECTION-B

2. Prove that the sequence $\{a_n\}$ where $a_n = 1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n} - \log n$ is convergent.

3. Discuss the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{1}{n} \sin \frac{1}{n}$.

4. The curve $r = a(1 + \cos \theta)$ revolves about the initial line. Find the volume of the figure formed.

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

SECTION-C

6. If $u = x^3 + y^3 + z^3 + 3xyz$, show that $x \frac{\partial V}{\partial x} + y \frac{\partial V}{\partial y} + z \frac{\partial V}{\partial z} = 3u$.

7. Obtain Taylor's expansion for $f(x, y) = y^x$ at $(1, 1)$ up to second-degree term.

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

9. Find the volume of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.

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.