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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (AI & ML/DS)(CE/CSE/IT/ETE/EEE/ECE/EE/DS/CSD)/(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 : 16-12-2024

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. Write briefly :

- a) Define oscillatory sequence with the help of an example.
- b) Show that the series $1 + \frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \dots + \frac{1}{2^{n-1}} + \dots$ converges to the sum 2.
- c) Define Comparison Test for the series.
- d) Find the length of the arc of the curve $y = x^{\frac{2}{3}}$ from $x = -1$ to $x = 8$.
- e) Test for convergence of integral $\int_1^{\infty} \frac{\log x}{x^2} dx$.
- f) Define Gamma function.
- g) What is Homogenous function? Give an example.
- h) Evaluate $\lim_{\substack{x \rightarrow 1 \\ y \rightarrow 2}} \frac{2x^2y}{x^2 + y^2 + 1}$.

i) Evaluate $\int_0^2 \int_0^{y^2} e^{x/y} dx dy$.

j) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} x y z dz dy dx$.

SECTION-B

2. Prove that the sequence $\{a_n\}$ where $a_n = \left(1 + \frac{1}{n}\right)^n$ is convergent.
3. Discuss the convergence or divergence of the series $\sqrt{\frac{1}{2^3}} + \sqrt{\frac{2}{3^2}} + \sqrt{\frac{3}{4^3}} + \dots$.
4. Find the area of the surface of revolution formed by the curve $r = 2a \cos \theta$ about the initial line.
5. Prove that $\beta(m, n) = \frac{\Gamma(m) \cdot \Gamma(n)}{\Gamma(m+n)}$ where $m > 0, n > 0$.

SECTION-C

6. If $V = (x^2 + y^2 + z^2)^{\frac{1}{2}}$, prove that $x \frac{\partial V}{\partial x} + y \frac{\partial V}{\partial y} + z \frac{\partial V}{\partial z} = -V$.
7. By Taylor's theorem, expand $e^x \sin y$ in power of x and y up to third degree term.
8. Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2 dy dx$, by change of order of integration.
9. Find the volume of the tetrahedron bounded by the coordinate planes and the plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$.

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.