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

Total No. of Questions : 09

B.Tech. (AI & DS/ AI & ML/ Block Chain / CSE / CE / CS / Computer Science and Design / EEE / EE / ECE / Electronics & Telecommunication Engineering / FT / IT / ME / Robotics & Artificial Intelligence/ 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: 08-12-2023

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

l. Answer briefly :

a) What do you mean by bounded and unbounded sequences?

b) Prove that the sequence $\frac{2n-7}{3n+2}$ is monotonically increasing.

c) Define *p*-Test for the series.

d) Find the length of the arc of the parabola $x^2 = 4ay$ extending from the vertex to one extremity of the latus rectum.

e) Test for convergence of integral $\int_0^\infty \frac{\sin^2 x}{x^2} dx$.

f) Define Beta function.

g) State Euler's theorem for homogeneous function.

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

i) Evaluate $\int_{1}^{\log 8} \int_{0}^{\log y} e^{x+y}\, dx\, dy$.

j) Evaluate $\int_{0}^{1} \int_{0}^{1-x} \int_{0}^{2-x} x\, y\, z\, dz\, dy\, dx$..

SECTION-B

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

3. Discuss the convergence or divergence of the series $\frac{1}{1.2.3} + \frac{2}{2.3.4} + \frac{5}{3.4.5} + \ldots\ldots\ldots$.

4. Find the surface of the solid generated by the revolution of the ellipse $x^2 + 4y^2 = 16$ about its major axis.

5. Prove that $\beta(m,n) = \frac{\Gamma(m).\Gamma(n)}{\Gamma(m+n)}$ *where* $m > 0, n > 0$.

SECTION-C

6. If $V = r^m$ *where* $r^2 = x^2 + y^2 + z^2$, show that $\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2} = m(m+1)r^{m-2}$.

7. Show that the first four terms of the Maclaurin's expansion of e^{ax} cos by are :

$$1 + ax + \frac{1}{\underline{2}}(a^2x^2 - b^2y^2) + \frac{1}{\underline{3}}(a^3x^3 - 3ab\,xy^2).$$

8. Evaluate $\int_{0}^{\infty} \int_{0}^{x} xe^{-x^2/y}\, dy\, dx$ by change of order of integration.

9. Evaluate $\iiint \frac{dx\,dy\,dz}{(x+y+z+1)^3}$ over the region $x \geq 0,\ y \geq 0,\ z \geq 0,\ x + y + z \leq 1$

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.