

Code No: 151AA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year I Semester Examinations, September/October - 2021

MATHEMATICS-I

(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, MMT, ECM, AE, MIE, PTM, CSBS, CSIT, ITE, CE(SE), CSE(CS), CSE(AI&ML), CSE(DS), CSE(IOT), CSE(Networks))

Time: 3 Hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & -2 & 3 \\ 2 & 5 & -4 & 6 \\ -1 & -3 & 2 & -2 \\ 2 & 4 & -1 & 6 \end{bmatrix}$ by converting it into normal form.
- b) Solve the system of equations $10x + y + z = 12$, $2x + 10y + z = 13$, $2x + 2y + 10z = 14$ by Gauss-Seidel method. [7+8]
2. For what values of ' λ ', the system of equations $x + y + z = 1$, $x + 2y + 4z = \lambda$, $x + 4y + 10z = \lambda^2$ will have a solution and solve them completely in each case. [15]
3. Determine the Eigen values and Eigen vectors of the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. [15]
- 4.a) Using Cayley – Hamilton theorem, find A^8 , if $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$
- b) Find the nature of the quadratic form $x^2 + 5y^2 + z^2 + 2xy + 2yz + 6zx$. [7+8]
- 5.a) Verify the convergence of the series $\sum \frac{(n!)^2}{(2n)!} x^{2n}$
- b) Discuss the convergence of the series $\sum_{n=1}^{\infty} \frac{n!}{(n^n)^2}$ [7+8]
- 6.a) Verify Rolle's theorem for the function $f(x) = \log \left\{ \frac{x^2 + ab}{x(a+b)} \right\}$ in (a, b).
- b) If $f(x)$ and $g(x)$ are respectively e^x and e^{-x} , prove that 'c' of Cauchy's mean value theorem is the arithmetic mean between a and b. [7+8]

7.a) Find the area of the tangent cut off from the parabola $x^2 = 8y$ by the line $x = 2y + 8$.

b) Prove that $\int_0^1 \frac{x^2 dx}{\sqrt{(1-x^4)}} = \int_0^1 \frac{dx}{\sqrt{(1-x^4)}} = \frac{\pi}{4\sqrt{2}}$. [7+8]

8.a) Verify whether $\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial y^2}$ where $u = \ln[y \sin x + x \sin y]$.

b) Show that the rectangular solid of maximum volume that can be inscribed in a sphere is a cube. [7+8]

---ooOoo---