

Code No: 131AA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year I Semester Examinations, July - 2021

MATHEMATICS-I

(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, MMT, AE, MIE, PTM, MSNT)

Time: 3 hours

Max. Marks: 75

Answer any five questions

All questions carry equal marks

- 1.a) Solve $(D^2 - 1)y = x \sinh x$.
- b) Solve $(D^2 + 4)y = \sec 2x$, by the method of variation of parameters. [7+8]
- 2.a) Solve $y'' + 4y = \tan 2x$ by the method of variation of parameters.
- b) Find the orthogonal trajectories of family of curves $\frac{x^2}{a^2 + \lambda} + \frac{y^2}{b^2 + \lambda} = 1$, where λ is a parameter. [7+8]
- 3.a) Determine the non-singular matrices P and Q such that the normal form of $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ is PAQ . Hence find its rank.
- b) Test for consistency and solve the system of equations $2x + y - z = 0$, $2x + 5y + 7z = 52$, $x + y + z = 9$. [7+8]
4. Solve the system of equations $x + y + z = 6$, $2x - 3y + 4z = 8$, $x - y + 2z = 5$ by Gauss-Jordan method. [15]
5. If $A = \begin{pmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{pmatrix}$, find the Eigen values of the matrix $A^8 - 5A^7 + 7A^6 - 3A^5 - 5A^3 + 8A^2 - 2A + I$ using Cayley-Hamilton theorem. [15]
- 6.a) If $u = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$, show that $x^2 u_{xx} + 2xy u_{xy} + y^2 u_{yy} = \tan^3 u$.
- b) Find the Mclaurin series expansion of $f(x, y) = e^x \ln(1 + y)$ upto 3rd degree terms. [7+8]
- 7.a) Show that $u = x + y + z$, $v = x^2 + y^2 + z^2$, $w = x^3 + y^3 + z^3 - 3xyz$ are Functionally dependent and find the relation.
- b) Determine the point on the paraboloid $z = x^2 + y^2$ which is closest to the point $(3, -6, 4)$ by Lagrange's method. [7+8]
- 8.a) Solve $x(y - z)p + y(z - x)q = z(x - y)$.
- b) Solve $p(1 + q) = qz$. [7+8]

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