Code No: 131AA **R16**

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

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1.a) Solve $\left(D^2-1\right)y = x\sinh x$.

b) Solve $\left(D^2+4\right)y = \sec 2x,$ 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 $x^2u_{xx}+2xyu_{xy}+y^2u_{yy}=\tan^3 u$.

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 parabolid $z=x^2+y^2$ 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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