

Code No: 121AB

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, July - 2021

MATHEMATICS-I

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

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

1. a) Find the value of k such that the rank of $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 1 & k & 3 & 1 \\ 0 & 0 & 1 & k \\ 0 & 0 & 1 & 1 \end{bmatrix}$ is 3.
- b) Find the non-trivial solution of the equations $x+5y+3z=0$, $5x+y-az=0$, $x+2y+z=0$. [7+8]
2. Find the Eigen values and the corresponding Eigen vectors of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$. [15]
3. Expand $e^x \sin y$ in powers of x and y up to 3rd degree terms. [15]
4. Prove that $\frac{\pi}{3} - \frac{1}{5\sqrt{3}} > \cos^{-1} \frac{3}{5} > \frac{\pi}{3} - \frac{1}{8}$ using Lagranges mean value theorem. [15]
5. a) Evaluate $\int_0^a \int_y^a \frac{xdxdy}{x^2 + y^2}$ by transforming into polar coordinates.
- b) Evaluate $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} dx dy dz$. [7+8]
6. Evaluate $\iint r \sin \theta dr d\theta$ over the cardioid $r = a(1 - \cos \theta)$ above the initial line. [15]
7. Solve by the method of variation of parameters $\frac{d^2 y}{dx^2} + 4y = \tan 2x$. [15]
8. a) Find $L\left(\frac{\sin t}{t}\right)$.
- b) Find inverse Laplace transform of $\log\left(\frac{s+2}{s-3}\right)$. [7+8]