Code No: 111AB **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, July - 2021
MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, CHEM, EIE, IT, MCT, MMT, AE, AME, MIE, PTM, AGE)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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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 $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} dxdydz$. [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 $\frac{d^2y}{dx^2}+4y=\tan 2x$. [15]

8.a) Find $L\left(\frac{S\text{in}\,t}{t}\right)$.

b) Find inverse Laplace transform of $\log\left(\frac{s+2}{s-3}\right)$. [7+8]

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