

Code No: 121AB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, June - 2022

MATHEMATICS - I

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

Time: 3 Hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) Determine the rank of the matrix $A = \begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 1 \end{bmatrix}$.
- b) Investigate the values of λ and μ so that the equations $2x+3y+5z=9$, $7x+3y-2z=8$, $2x+3y+\lambda z=\mu$ have (i) no solution, (ii) a unique solution and (iii) an infinite number of solutions. [7+8]
2. Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to the canonical form and also write the nature of the quadratic matrix. [15]
- 3.a) State Rolle's theorem and verify it for $f(x) = \frac{\sin x}{e^x}$ in $[0, \pi]$.
- b) If $x = r \cos \theta$, $y = r \sin \theta$ then prove that $\frac{\partial(x,y)}{\partial(r,\theta)} \times \frac{\partial(r,\theta)}{\partial(x,y)} = 1$. [7+8]
- 4.a) Prove that $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.
- b) Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dx dy$ by changing to polar coordinates. [8+7]
- 5.a) If a substance cools from 370°K to 330°K in 10 min., when the temperature of the surrounding air is 290°K , find the temperature of the substance after 40 min.
- b) Solve $(D^2 + 2)y = x^2 + x^3 + e^{-2x} + \cos 3x$, where $D = \frac{d}{dx}$. [7+8]
- 6.a) Solve $(D^3 - D)y = 2x + 4\cos x + 2e^x$, where $D = \frac{d}{dx}$.
- b) Solve by method of variation of parameters $\frac{d^2y}{dx^2} + 4y = \tan 2x$. [8+7]

7.a) Find $L\left\{\frac{\sin 3t \cdot \cos t}{t}\right\}$ and $L\{t^2 \cos 2t\}$.

b) Find $L^{-1}\left\{\frac{s^2}{(s^2 + 4)(s^2 + 9)}\right\}$ Using Convolution theorem. [8+7]

8.a) (i) Find the Laplace Transform of $\left\{\left(\sqrt{t} + \frac{1}{\sqrt{t}}\right)^3\right\}$ and

(ii) Find $L\{e^{-t} \sin 2t\}$.

b) Solve the differential equation by Laplace transforms method.
 $y'' + 4y' + 3y = e^{-t}$, $y(0) = y'(0) = 1$.

[8+7]

--ooOoo--

downloaded from
StudentSuvidha.com