

R18

Code No: 151AA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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

MATHEMATICS-I

(Common to EEE, CSE, IT, CSIT, ITE, CE(SE), CSE(CS), CSE(DS), CSE(Networks))

Time: 3 Hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

1.a) Find the inverse of the matrix $A = \begin{bmatrix} -1 & -3 & 3 & -1 \\ 1 & 1 & -1 & 0 \\ 2 & -5 & 2 & -3 \\ -1 & 1 & 0 & 1 \end{bmatrix}$ using Gauss-Jordan method.

b) Find whether the following equations are consistent if so solve them
 $x - y + 2z = 9, 2x + y + z = 6, x + 2y + z = 3$ [7+8]

2. Find the Eigen values and Eigen vectors of the matrix $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ [15]

3. Find the matrix P which transforms $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ into diagonal form. Hence calculate A^4 . [15]

4.a) Examine the convergence of the series $\sum \frac{(n+1)(n+2)}{n^2 \sqrt{n}}$

b) Test for the convergence of the series $1 + \frac{2}{5}x + \frac{6}{9}x^2 + \frac{14}{17}x^3 + \dots + \frac{2^n - 2}{2^n + 1}x^{n-1} + \dots$ ($x > 0$) [7+8]

5.a) Discuss the nature of the series $\sum \frac{(n+1)^n x^n}{x^{n+1}}$

b) Verify whether the series $\frac{x}{1+x} - \frac{x^2}{1+x^2} + \frac{x^3}{1+x^3} - \frac{x^4}{1+x^4} + \dots \infty$ ($0 < x < 1$) is absolutely convergent or conditionally convergent. [7+8]

6.a) Expand $e^{\sin x}$ by Maclaurin's series

b) Prove that $\beta(m+1, n) + \beta(m, n+1) = \beta(m, n)$. [7+8]

8R 8R 8R 8R 8R 8R 8

7.a) If $u = x^2 - 2y, v = x + y + z, w = x - 2y + 3z$ then find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$.

8R 8R 8R 8R 8R 8R 8

b) If $f(x, y) = \ln(x^2 + y^2) + \tan^{-1}\left(\frac{y}{x}\right)$ then prove that $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} = 0$. [7+8]

8.a) A rectangular box open at the top is to have volume of 32 cubic ft. Find the dimensions of the box requiring least material for its construction.

8R 8R 8R 8R 8R 8R 8

b) If $u = \frac{x+y}{1-xy}$ and $\theta = \tan^{-1} x + \tan^{-1} y$, then find $\frac{\partial(u, \theta)}{\partial(x, y)}$. Hence prove that u and θ are functionally dependent. Also find the relation between them. [7+8]