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
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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 $\sum \dfrac{(n+1)(n+2)}{n^2 \sqrt{n}}$

b)   Test for the convergence of the series $1 + \dfrac{2}{5} x + \dfrac{6}{9} x^2 + \dfrac{14}{17} x^3 + ... + \dfrac{2^n - 2}{2^n + 1} x^{n-1} + ... \ (x > 0)$

[7+8]

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

b)   Verify whether the series $\dfrac{x}{1+x} - \dfrac{x^2}{1+x^2} + \dfrac{x^3}{1+x^3} - \dfrac{x^4}{1+x^4} + ...\infty \ (0 < x < 1)$ 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]

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

b) If $f\ x,y = \ln x^2 + y^2 + \tan^{-1} \dfrac{y}{x}$ then prove that $\dfrac{\partial^2 f}{\partial x^2} + \dfrac{\partial^2 f}{\partial y^2} = 0.$ [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.

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

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