R18

Code No: 151AA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, May/June - 2019
MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, EIE, IT MCT, MMT, AE, MIE, PTM)

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

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Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) If A is orthogonal matrix, prove that A^T and A^{-1} are also orthogonal. [2]

b) Find the Eigen values of A^2, if $A=\begin{bmatrix} 1 & 2 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 1 \end{bmatrix}$. [2]

c) State Cauchy's integral test. [2]

d) State Rolle's theorem. [2]

e) State Euler's theorem for homogeneous function in x and y. [2]

f) State the conditions when the system of non homogenous equations AX=B will have i) unique solution ii) Infinite no of solutions iii) No solution. [3]

g) Prove that the Eigen values of a skew- Hermitian matrix are purely imaginary or zero. [3]

h) State Leibnitz test. [3]

i) Evaluate $\int_0^\infty e^{x^3} x^7 dx$. [3]

j) Find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$, if $u = x + y + z, v = x + y \text{ and } z = z$. [3]

PART- B

(50 Marks)

2. Using Gauss Seidel method solve 25x + 2y + 2z = 69, 2x + 10y + z = 63, x + y +z = 43. [10]

OR

3. Solve the system of equations x – y + 2z = 4, 3x + y + 4z = 6, x + y + z = 1 using Gauss elimination method. [10]

4. Find Eigen values and Eigen vectors of $\begin{bmatrix} 2 & 1 & -1 \\ 1 & 1 & -2 \\ -1 & -2 & 1 \end{bmatrix}$. [10]

OR

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5. Find Eigen values and Eigen vectors of $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. [10]

6.a) Test the convergence of the series $\sum_{n=0}^{\infty} \frac{n!(n+1)!}{(3n)!}$.

b) Find the radius of convergence of the series $\sum_{n=0}^{\infty} \frac{n^3 x^{3n}}{n^4+1}$. [5+5]

OR

7. Does the series $\sum_{n=0}^{\infty} \frac{(-1)^n}{\sqrt{n^2+1}}$ converge absolutely, conditionally or diverge? [10]

8.a) Expand $\tan^{-1}x$ in powers of $(x-1)$ using Maclaurin's theorem.

b) Find the volume of the solid that results when the region enclosed by the curves xy = 1, x - axis and x = 1 rotated about x – axis. [5+5]

OR

9.a) Verify Cauchy mean value theorem for the functions e^x and e^{-x} in the interval *(a,b)*.

b) Evaluate $\int_0^{\infty} x^4 e^{-x^2} dx$ Beta and Gamma. [5+5]

10.a) If u = $\log\left(\frac{x^2+y^2}{x+y}\right)$ prove that x $\frac{\partial u}{\partial x}$ + y $\frac{\partial u}{\partial y}$ = 1.

b) If x + y + z = u, y + z = uv, z = uvw, then evaluate $\frac{\partial(x,y,z)}{\partial(u,v,w)}$. [5+5]

OR

11.a) Show that U = $x^2 e^{-y}\cosh z$, V = $x^2 e^{-y}\sinh z$, w = $x^2+y^2+z^2-xy-yz-zx$ are functionally dependent. If dependent find the relationship between them.

b) Find the maximum of $x^2+y^2+z^2$ such that 2x+3y+z=14 using Lagrange's multiplier method. [5+5]

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