R18

Code No:151AA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B .Tech I Year I Semester Examinations, December - 2018
MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, MMT, AE, MIE, PTM)

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

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 Hermitian matrix and B is a Skew- Hermitian matrix , prove that (B+iA) is Skew -Hermitian matrix. [2]

b) Let A be a square matix of order 3 with Eigenvalues 2, 2 and 3 and A is diagonalizable then find rank of (A-2I). [2]

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

d) Find the value of $\Gamma\left(-\frac{1}{2}\right)$ [2]

e) Verify Euler's theorem for the function $xy+yz+zx$. [2]

f) Prove that the transpose of a unitary matrix is unitary. [3]

g) Find the Eigen values of the matrix $A=\begin{pmatrix} 1 & 2 & 2 \\ 0 & 2 & 1 \\ -1 & 2 & 2 \end{pmatrix}$ [3]

h) Test for convergence $\sum_{n=1}^{\infty}\frac{\sqrt{n}}{n^2+1}$. [3]

i) Discuss the applicability of Rolle's Theorem to the function $f(x)=2+(x-1)^{\frac{2}{3}}$ in the interval [0, 2] . [3]

j) If $u=\sin^{-1}\left(\frac{x}{y}\right)+\tan^{-1}\frac{y}{x}$ show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=0$. [3]

PART - B

(50 Marks)

2.a) Reduce the given matrix into normal form and hence find the rank

$$\begin{pmatrix} 2 & 3 & -2 & 5 & 1 \\ 3 & -1 & 2 & 0 & 4 \\ 4 & -5 & 6 & -5 & 7 \end{pmatrix}$$

b) Solve the equations $x+y+z=6;\ 3x+3y+4z=20;\ 2x+y+3z=13$ using Gauss elimination method. [5+5]

OR

3.a) Find the rank of the matrix $\begin{pmatrix} -1 & -3 & 3 & -1 \\ 1 & 1 & -1 & 0 \\ 2 & -5 & 2 & -3 \\ -1 & 1 & 0 & 1 \end{pmatrix}$ by reducing it to Normal form.

b) Solve the system of equations by Gauss-Seidel method $20x+y-2z=17$; $3x+20y-z=-18$; $2x-3y+20z=25$. [5+5]

4.a) Let $A=\begin{pmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$, and $A^{-1}=\alpha A^2+\beta A+\gamma I$, $\alpha,\beta,\gamma\in R$, then find $\alpha+\beta+\gamma$.

b) Find the nature of the quadratic form $10x^2+2y^2+5z^2-4xy-10xz+6yz$. [5+5]

OR

5.a) Let A be a 3×3 matric over R such that det (A) =6 and tr (A)=0. If det(A+I)=0, where I is the identity matrix of order 3, then find the Eigen values of A .

b) Reduce the quadratic form $5x^2+26y^2+10z^2+4yz+14zx+6xy$ to canonical form. [5+5]

6.a) Test the convergence of the series $1+\frac{x}{2}+\frac{2!}{3^2}x^2+\frac{3!}{4^3}x^3+.....$

b) Examine the following series for convergence $\sum\frac{(-1)^{n-1}\sin nx}{n^3}$. [5+5]

OR

7.a) Test for convergence of the series $\sum\frac{x^n}{(2n)!}$.

b) Examine for absolute convergence the series $x-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}+.....$. [5+5]

8.a) Show that $\frac{\tan x}{x}>\frac{x}{\sin x}$, $o<x<\frac{\pi}{2}$.

b) Find the surface area of the solid generated by revolving the loop of the curve $9y^2=x(x-3)^2$. [5+5]

OR

9.a) Show that $|\cos b-\cos a|\le|b-a|$.

b) Show that $\int_0^\infty x^{m-1}(a-x)^{n-1}dx=a^{m+n-1}\beta(m,n)$. [5+5]

10.a) If $u=f(y-z,z-x,x-y)$ show that $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z}=0$.

b) If $x=uv, y=\frac{u+v}{u-v}$ determine $\frac{\partial(u,v)}{\partial(x,y)}$. [5+5]

OR

11.a) If $U=x+y-z, V=x-y+z, W=x^2+y^2+z^2-2yz$, show that the functions are functionally dependent.

b) The temperature T at any point (x, y, z) in space is $T=400xyz^2$. Find the highest temperature on the surface of the unit sphere $x^2+y^2+z^2=1$. [5+5]

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