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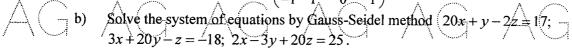
R18 Code No:151AA JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD B. Tech I Year I Semester Examinations, December - 2018 **MATHEMATICS-I** (Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, MMT, AE, MIE, PTM) Time: 3 hours Max. Marks: 75 Note: This question paper contains two parts A and B. Part A 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. If A is Hermitian matrix and B is a Skew-Hermitian matrix, prove that (B+iA) is 1.a) Skew -Hermitian matrix. Let A be a square matix of order 3 with Eigenvalues 2, 2 and 3 and A is diagonalizable b) then find rank of (A-2I). State Cauchy's root test. d) Find the value of Γ [2] Verify Euler's theorem for the function xy + yz + zx. e) [2] f) Prove that the transpose of a unitary matrix is unitary. Find the Eigen values of the matrix $A \neq \begin{bmatrix} 0 & 2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$ Test for convergence $\sum_{n=1}^{\infty} \frac{\sqrt{n}}{n^2 + 1}$. [3] Discuss the applicability of Rolle's Theorem to the function $f(x) \neq 2 + (x-1)^{\frac{2}{3}}$ in the interval [0, 2] . If $u = \sin^{-1}\left(\frac{x}{v}\right) + \tan^{-1}\frac{y}{x}$ show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$. [3] PART - B Reduce the given matrix into normal form and hence find the rank $\begin{pmatrix} 2 & 3 & -2 & 5 & 1 \\ 3 & -1 & 2 & 0 & 4 \\ 4 & -5 & 6 & -5 & 7 \end{pmatrix}$ Solve the equations x + y + z = 6; 3x + 3y + 4z = 20; 2x + y + 3z = 13 using elimination method.



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



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

- Find the nature of the quadratic form $10x^2 + 2y^2 + 5z^2 = 4xy 10xz + 6yz$. Let A be a 3×3 matric over R such that det (A) =6 and tr (A)=0. If det(A+I)=0, where 1 is the identity matrix of order 3, then find the Eigen values of A.
- Reduce the quadratic form $5x^2 + 26y^2 + 10z^2 + 4yz + 14zx + 6xy$ to canonical form. b)

[5+5]

Test the convergence of the series $1 + \frac{x}{2} + \frac{2!}{3^2}x^2 + \frac{3!}{4^3}x^3 + \cdots$ Examine the following series for convergence $\sum_{n=1}^{\infty} \frac{(-1)^{n-1} \sin^n nx}{n^3}$.



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



Examine for absolute convergence the series $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$

- Show that $\frac{\tan x}{x} > \frac{x}{\sin x}$, $o < x < \frac{\pi}{2}$.
 - Find the surface area of the solid generated by revolving the loop of the curve $9y^2 = x(x-3)^2.$ [5+5]



Show that $\int x^{m-1} (a-x)^{n-1} dx = a^{m+n-1} \beta(m,n)$.

[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 $\frac{\partial(u,v)}{\partial(x,y)}$.







- 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.
 - 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 $x^2 + y^2 + z^2 = 1$.