

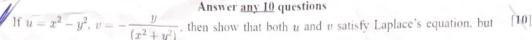




Final Assessment Test (FAT) - November/December 2022

Programme	B.Tech.	Semester	Fall Semester 2022-23
	COMPLEX VARIABLES AND LINEAR ALGEBRA	Course Code	BMAT201L
Faculty Name	Prof. Dr. SUSHMITHA	Slot	A2+TA2+TAA2
		Class Nbr	CH2022231001195
Time	3 Hours	Max. Marks	100

Part A (10 X 10 Marks)



/u + iv is not an analytic function of z.

Find the bilinear transformation that maps the points z = -1, 0, 1 in z-plane onto the points [10] $w \neq 0, i, 3i$ in w-plane.

Find the fixed points and the image of upper half of the z-plane under the transformation $w = \frac{1}{1-z}$. [5+5 Marks]

Find the image of the line segment from 1 to i under the complex mapping $w = -i\bar{z}$, where \bar{z} represents the conjugate of z.

 \Re Find all the points where the mapping $f(z) = \sin(z)$ is conformal. [7+3 Marks]

Expand $f(z) = \frac{1}{(z-1)^2(z-3)}$ in a Laurent's series valid for 0 < |z-1| < 2. [10]

Define singularity of a complex function and determine the type of singularity of

$$f(z) = ze^{\frac{z-1}{z^3 - 1 - 3z^2 + 3z}} - \frac{e^{\frac{1}{z-1}}}{\frac{1}{e^{\frac{1}{1-z}}}}.$$
 [5+5 Marks]

Evaluate $\int \frac{z \cosh(z)}{z^{5} + 2iz^{4}} dz$ over a closed curvé C, where C is a unit circle, using Cauchy's integral formula

Find a basis of row space, column space and null space for the given matrix A and hence, verify the rank-nullity theorem

$$A = \begin{pmatrix} 1 & 2 & 0 & 2 & 5 \\ -2 & -5 & 1 & -1 & -8 \\ 0 & -3 & 3 & 4 & 1 \\ 3 & 6 & 0 & -7 & 2 \end{pmatrix}$$



 $S_1 = \{(1, 2, -1, 4), (1, 0, 1, 0), (1, -1, 0, 1)\} \subset \mathbb{R}^4.$ $S_2 = \{t - 1, t^2 - 1, -t^2 + 2t - 1\} \subset \mathcal{P}_2(\mathbb{R}), \text{ where } \mathcal{P}_2(\mathbb{R}) \text{ represents the vector space of polynomials of degree at most 2. [5+5 Marks]}$



$$A = \begin{bmatrix} -8 & 5 \\ -41 & 24 \\ -3 & 2 \end{bmatrix}$$

Find the unique linear transformation $T: \mathbb{R}^2 \to \mathbb{R}^3$ so that A is the associated matrix of T with respect to bases, $\alpha = \{(1,3),(2,5)\}$ and $\beta = \{(1,0,0),(1,1,0),(1,1,1)\}$.

(b) Find T(2,3).

Let $F: \mathbb{R}^4 \to \mathbb{R}^3$ be linear mapping defined by

[10]

F(x, y, s, t) = (x - y + s + t, x + 2s - t, x + y + 3s - 3t). Find basis and dimension of image of F.

10. Find an orthonormal basis for the solution space of the homogeneous system of linear equations [10]

+y-2z+w=0; y+2z+w=0.

1). Solve the system of linear equations x + 2y - z = -1, 3x + 8y + 2z = 28, 4x + 9y - z = 14 [10]

ysing the Gauss-Jordan method,

12. Find the eigenvalues and eigenvectors of the given matrix [10]

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

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