



Continuous Assessment Test (CAT)- II- October 2022

Programme	: B.Tech.	Semester	: Fall 2022-2023
Course Title	: Complex Variables and Linear Algebra	Code	: BMAT201L
Faculty	: Dr. M. Dhivya, Dr. N. Durga, Dr. M. Prasannalakshmi, Dr. C. Rajivganthi, Dr. Ashish Kumar, Dr. Prosenjit, Dr. Ankit Kumar, Dr. Surath Ghosh, Dr. Sandip Saha, Dr. Kamallesh, Dr. P. Sushmitha, Dr. Amitkumar Rahul	Slot	: A1+TA1+TAA1
Duration	: 1 ½ Hours	Class Nbr	: CH2022231001157, 60, 62, 64, 67, 70, 72, 74, 76, 80, 82
		Max. Marks	: 50

Answer all the Questions (50 marks)

Q.No.	Question Description	Marks
1.	<p>a) A complex function $f(z)$ is defined as follows</p> $f(z) = \begin{cases} \operatorname{Re}(z), & x \geq 5 \\ \operatorname{Im}(z+1), & x < 5 \end{cases}$ <p>Evaluate $\int_C f(z) dz$, where C is the curve</p> $y = \begin{cases} -x^2, & \text{from } -2-4i \text{ to } 0 \\ 0, & \text{from } 0 \text{ to } 5 \\ x, & \text{from } 5 \text{ to } 10+10i \end{cases}$ <p>b) Expand the function $f(z) = \frac{z-1}{z^2}$ in a Laurent series valid for i) $z-1 >1$ ii) $z-1 <1$.</p>	[5+5]
2.	<p>a) Evaluate $\int_C \frac{z^2 e^{2z+1} dz}{(z+1)^2(z^2-9)}$, where C is $z+1 =3$.</p> <p>b) Classify the singularity $z=0$ for $f(z) = \frac{1}{1-e^{z^2}}$</p>	[7+3]
3.	<p>Evaluate $\int_0^{2\pi} \frac{1}{1-2a \cos \theta + a^2} d\theta$, $a \neq 1$</p>	[10]
4.	<p>a) Check whether the given set of vectors $S = \left\{ \begin{pmatrix} 1 \\ 3 \end{pmatrix}, \begin{pmatrix} 2 \\ 4 \end{pmatrix}, \begin{pmatrix} -1 \\ 2 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \end{pmatrix}, \begin{pmatrix} 5 \\ 0 \end{pmatrix}, \begin{pmatrix} 4 \\ 5 \end{pmatrix} \right\}$ is linearly independent or not.</p> <p>b) Find a basis for the vector space $W = \{(x_1, x_2, x_3, x_4) \in \mathbb{R}^4 x_1 + x_2 - 2x_3 + x_4 = 0, 2x_1 - x_2 + x_3 = 0, 4x_1 + x_2 - 3x_3 + 2x_4 = 0\}$. What is the dimension of W?</p>	[5+5]
5.	<p>a) Let V be the set of all polynomials of degree at most 2. Is $W = \{p(x) \in V : p''(x) = 0\}$ a subspace of V?</p> <p>b) Check whether $W = \{A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} : A^2 = aI\}$ is a subspace of set of all 2×2 matrices.</p>	[5+5]