Reg No.:_______________ Name:__________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third semester B.Tech examinations (S) September 2020

Course Code: MA201

Course Name: LINEAR ALGEBRA AND COMPLEX ANALYSIS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks Marks

1	a)	Check whether the function $f(x+iy) = \frac{2xy^2}{x^2+3y^2}, x, y \neq 0, f(0) = 0$ is continuous at the origin.	(7)
	b)	Find an analytic function $f(z) = u + iv$ whose real part is $e^{-x}(x\cos y + y\sin y)$	(8)
2	a)	Check whether $f(z) = \log z$ is analytic.	(7)
	b)	Show that $w = \frac{z-i}{z+i}$ maps the real axis of z-plane into the circle $\|w\| = 1$ and the half plane $y > 0$ into the interior of the unit circle $\|w\| = 1$ in the w-plane	(8)
3	a)	Find the image of the infinite strip $-2 \leq x \leq 2$ under the mapping $w = e^z$	(7)
	b)	Find the image of the line $y - x + 1 = 0$ under the mapping $w = \frac{1}{z}$	(8)

PART B

Answer any two full questions, each carries 15 marks

4	a)	Evaluate $\int_C \frac{z^2+2z-2}{z-4} dz$ where C: $\|z\| = 5$, using Cauchy's Integral formula.	(7)
	b)	Evaluate $\int_{(1,1)}^{(4,2)} [(x+y)dx + (y-x)dy]$ along a straight line from (1,1) to (1,2) and then to (4,2)	(8)
5	a)	Find the Laurent series expansion about the singularity $z = 1$ for the function $\frac{z^2}{(z-1)^2(z+3)}$	(7)
	b)	Find the pole and residue of $\frac{1}{(z^2+1)^3}$	(8)
6	a)	Using Cauchy's residue theorem evaluate $\int_C \frac{z^2}{(z-1)^2(z+2)} dz$ where C is $\|z-2\| = 2$	(7)
	b)	Evaluate $\int_0^{\pi} \frac{a\, d\theta}{a^2+sin^2\theta}$	(8)

PART C

Answer any two full questions, each carries 20 marks

7	a)	Using Guass elimination method, solve the equations $x + 2y + 3z - w = 10$, $2x + 3y - 3z - w = 1$, $2x - y + 2z + 3w = 7, 3x + 2y - 4z + 3w = 2$.	(12)

b) Check whether the vectors $X_1 = (2,-1,3,2)$, $X_2 = (1,3,4,2)$ and $X_3 = (3,-5,2,2)$ are linearly independent or not (8)

8 a) For what values of μ, the system of equations $x + y + z = 1, x + 2y + 4z = \mu$ and $x + 4y + 10z = \mu^2$ got (i) unique solution (ii) infinite solution (iii) No solution. (10)

b) If the eigen values of the matrix $A = \begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$ are 1,2 and 3. Find the eigen values of A^5 and A^{-1} without using characteristic equation. (10)

9 a) Find the nature, rank and signature of the quadratic form (10)

$$3x^2 + 5y^2 + 3z^2 - 2xy + 2xz - 2yz$$

b) Diagonalise $\begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}$ (10)

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