

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 Gauss 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 $3x^2 + 5y^2 + 3z^2 - 2xy + 2xz - 2yz$ (10)
- b) Diagonalise $\begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}$ (10)
