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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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