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Name:

Reg. No._____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

THIRD SEMESTER B.TECH DEGREE EXAMINATION, DEC 2016

Course Code: MA201

Course Name: LINEAR ALGEBRA AND COMPLEX ANALYSIS

Max. Marks: 100

Duration:3. Hours

(8)

PART A

(Answer any *two* questions)

1.a Show that $u = y = 5x$ yis harmonic and hence find its harmonic conjugate. (.a	Show that $u = y^3 - 3x^2$	² yıs harmonıc	and hence find it	s harmonic conju	gate. (8)
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- b Find the image of $|z \frac{1}{2}| \le \frac{1}{2}$ under the transformation $= \frac{1}{z}$ Also find the fixed points of the transformation $w = \frac{1}{z}$ (7)
- 2.a Define an analytic function and prove that an analytic function of constant modulus is constant.(8)
- b Find the linear fractional transformation that maps $z_1 = 0, z_2 = 1, z_3 = \infty$ onto $w_1 = -1, w_2 = -i, w_3 = 1$ respectively. (7)
- 3.a Show that $f(z) = e^{-s} \cos y i e^{-s} \sin y$ is differentiable everywhere. Find its derivative. (8)
- b Find the image of the lines x = c and y = k, where c&kare constants, under the transformation w = sinz. (7)

PART B

(Answer any *two* questions)

- 4.a Evaluate \int_{C} Re (z) dz where C is a straight line from 0 to 1 + 2i. (7)
- b Show that $\int_{2}^{\infty} \frac{ds}{1+s^4} = \frac{n}{2\sqrt{2}}$ (8)
- 5.a Integrate $\frac{z}{z^{2}-1}$ counterclockwise around the circle $|z-1-i| = \frac{n}{2}$ by Cauchy's Integral Formula. (7)

b Evaluate
$$\int_{C} \frac{z^{-23}}{z^{2}-4z^{-5}} dz$$
 where C is $|z - 2 - i| = 3.5$ by Cauchy's Residue Theorem

- 6.a If $f(z) = \frac{1}{z^2}$ find the Taylor series that converges in |z i| < Rand the Laurent'sseries that converges in |z - i| > R. (8)
- b Define three types of isolated singularities with an example for each. (7)



PART C

(Answer any *two* questions)

7.a Solve by Gauss Elimination:

$$x_1 - x_2 + x_3 = 0,$$

$$-x_1 + x_2 - x_3 = 0,$$

$$10 x_2 + 25 x_3 = 90,$$

$$20 x_1 + 10 x_2 = 80.$$
 (5)

b Find the rank. Also find a basis for the row space and column space for

c Find out what type of conic section the quadratic form 1 = 2

 $Q = 17 x^2 - 30 xy + 17 y^2 = 128$ represents and transform it to the principal axes. (10)

8.a Find whether the vectors [1 2-1 3], [2 -13 2] and [-1 8-9 5] are linearly dependent. (5)

b Show that the matrix
$$A = \begin{bmatrix} 1 & 2 \\ 2 & -2 \end{bmatrix}$$
 is symmetric. Find the spectrum. (5)

c Diagonalise A =
$$\begin{bmatrix} -6 & 7 & -4 \end{bmatrix}$$
 (10)
2 -4 3

9. a. Determine whether the matrix
$$\begin{vmatrix} 1 & 0 & -1 \\ 0 & 1/ & \sqrt{2} \\ 0 & \sqrt{2} & \sqrt{2} \\ 0 & 1/ & 1/ \\ \sqrt{2} & \sqrt{2} \end{vmatrix}$$
 is orthogonal? (5)

- b. Find the Eigen values and Eigen vectors of $\begin{bmatrix} 1 & 1 & 2 \\ -1 & 2 & 1 \end{bmatrix}$ (5) 0 1 3
- c. Define a Vector Space with an example. (10)

