Code No: 133BD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD B.Tech II Year I Semester Examinations, December - 2019 MATHEMATICS – IV

(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, ETM, MMT, AE, MIE, PTM, CEE, MSNT) Time: 3 Hours Max. Marks: 75

Note: This question paper contains two parts A and B.Part A is compulsory which carries 25 marks. Answer all questions in Part A.Part B consists of 5 Units. Answer any one full question from each unit.Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

1.a) Write C.R equations in Cartesian coordinates. [2] Check whether $u = \sin x \cosh y$ is harmonic function or not. b) [3] Expand e^z as Taylor's series about z=1. [2] c) Evaluate $\int_{0}^{1+i} z^2 dz$ along $y=x^2$. d) [3] Find the fixed points of $f(z) = \frac{3iz+1}{z+i}$ e) [2] Write the properties of a bilinear transformation. f) [3] What is the Fourier coefficient a_0 of $f(x) = 3x^2 - 2$ in [-3,3]**g**) [2] If F(p) is the Fourier Transform of f(x), prove that $F(f(ax)) = \frac{1}{a}F(\frac{p}{a})$. h) [3] Give an example for a parabolic second order linear partial differential equation. [2] i) i) Write all possible solutions of one dimensional wave equation. [3] **PART-B**

2.a) Find the analytic function whose real point is x-2xy.b) Derive C-R equations in polar form. [5+5]

OR

- 3.a) Show that $f(z) = z\overline{z}$ is differentiable but not analytic at origin.
 - b) Show that $u(x, y) = e^{-2x} \sin 2y$ is harmonic and determine its harmonic conjugate.

[5+5]

(50 Marks)

(25 Marks)

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4.a) Evaluate
$$\int_{c} \frac{e^{z} + 2\sinh(z) dz}{(z - \pi i)^{2}}$$
 where c: $|z| = 4$

b) Find the Taylor's series for $f(z) = \frac{e^z}{1-z}$ around z=0 and give the radius of convergence.

OR

[5+5]

5.a) Find the Laurent's series expansion of
$$f(z) = \frac{7z-2}{z^3 - z^2 - 2z}$$
 in the region 1<1+z<3.

b) By Residue theorem, evaluate $\oint_C \frac{\tan z}{z^2 - 1} dz$ where C:|z|=2. [5+5] WWW.manaresults.co.in

6. Evaluate
$$\int_{-\infty}^{\infty} \frac{1}{(x^2+1)^2} dx$$
 using Residue theorem. [10]

- 7.a) Find the bilinear transformation that maps from (-2, -1 i, 0) to (-1, 0, 1).
 - b) Prove that the transformation $w = \frac{1}{z}$ takes circles on to circles. [5+5]
- 8. Find the Fourier series expansion of $f(x) = x \sin x$, $0 < x < 2\pi$. [10] OR
- 9. Find the Fourier Transform of $f(x) = \begin{cases} 1 x^2, & \text{if } |x| \le 1 \\ 0, & \text{if } |x| > 1 \end{cases}$. Hence evaluate

$$\int_{0}^{\infty} \frac{x\cos x - \sin x}{x^3} \cos \frac{x}{2} dx$$
[10]

10. Solve by method of separation of variables $4u_x + u_y = 3u$ where $u(0, y) = 3e^{-y} - e^{-5y}$. [10] **OR**

11. Find all possible solutions of one dimensional heat equation. [10]

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