

Code No: 133BD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, August/September - 2022

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

Answer any five questions  
All questions carry equal marks

- - -

- 1.a) Show that  $f(z) = \bar{z}$  is not differentiable at  $z = 0$ .  
 b) Find 'k' such that  $u(x, y) = x^3 + 3kxy^2$  is Harmonic and find its Conjugate. [7+8]
- 2.a) Check the continuity of  $f(z) = \begin{cases} \frac{z}{|z|} & \text{if } z \neq 0 \\ 0 & \text{if } z = 0 \end{cases}$   
 b) Find the analytic function  $f(z)$  whose real part  $u = \sin x \cosh y$  [8+7]
- 3.a) Evaluate  $\oint_C (z - a)^n dz = 0$  if  $(n \neq -1)$  Where C is the circle  $|z - a| = r$ .  
 b) Evaluate  $\oint_C \frac{e^{-3z}}{z+2} dz$  where c is the circle  $|z| = 4$  using Cauchy's integral formula. [8+7]
- 4.a) Find the Laurent's series of  $f(z) = \frac{z}{(z^2-1)(z^2-4)}$  for  $1 < |z| < 2$ .  
 b) Evaluate  $\oint_C \frac{1+z}{z(2-z)} dz$  Where c:  $|z| = 1$  using Cauchy's residue theorem. [7+8]
- 5.a) Evaluate  $\int_0^\pi \frac{1}{3+2 \cos \theta} d\theta$  using Residue theorem.  
 b) Evaluate  $\int_{-\infty}^{\infty} \frac{x^2 dx}{(x^2+1)(x^2+4)}$  using Residue theorem. [8+7]
- 6.a) Evaluate  $\int_0^\infty \frac{x \sin 2x}{(16+x^2)} dx$  using Residue theorem.  
 b) Find the bilinear transformation which maps the points  $z = 1, i, -1$  respectively onto  $w = i, 0, -i$  [8+7]
- 7.a) Find the Fourier series of  $f(x) = \begin{cases} -1, & -\pi < x < 0 \\ 1, & 0 < x < \pi \end{cases}, f(x + 2\pi) = f(x) \forall x$ .  
 b) Find the Finite Fourier sine transform of  $f(x) = \frac{x}{\pi}$  in  $(0, \pi)$ . [8+7]
8. A Rod of length 10 cm has its ends A and B kept at  $50^\circ\text{C}$  and  $100^\circ\text{C}$  until steady state conditions prevail. The temperature at A is then suddenly raised to  $90^\circ\text{C}$  and that at B is lowered to  $60^\circ\text{C}$  and the end temperatures are there after maintained. Find the temperature at a distance x from one end at a time. [15]

---oo0oo---