Code No: 133BD **R16**

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
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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 $f(z) = \begin{cases} \frac{z}{|z|} & if \quad z \neq 0 \\ 0 & if \quad z = 0 \end{cases}$

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 $\oint_c \frac{e^{-3z}}{z+2}$ where c is the circle |z| = 4using 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 $w \doteq , 0, -i$ [8+7]

7.a) Find the Fourier series of $f(x) = \{ \begin{matrix} -1, -\pi < x < 0 \\ 1, \; 0 < x < \pi \end{matrix}$,f(x + 2π) = f(x) ∀ x.

b) Find the Finite Fourier sine transform of f(x) = $\frac{x}{\pi}$ in (0,π). [8+7]

8. A Rod of length 10 cm has its ends A and B kept at 50 ^{0}C and 100 ^{0}C until steady state conditions prevail. The temperature at A is then suddenly raised to 90 ^{0}C and that at B is lowered to 60^{0}C and the end temperatures are there after maintained. Find the temperature at a distance x from one end at a time. [15]

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