

Code No: 133BD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, March - 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) Find the analytic function whose real part is $e^{-x}(x \sin y - y \cos y)$
 b) Find the value of 'a' if $\cos ax \sin hy$ is harmonic. [8+7]
- 2.a) Evaluate $\int_C \frac{dz}{e^z(z-1)^3}$ where C is $|z|=2$
 b) Find the poles and the residues at each pole of $\frac{z+1}{z^2(z-2)}$ [7+8]
3. Evaluate Using Residue theorem $\int_C \frac{(z^2 - z + 2)dz}{(z^4 + 10z^2 + 9)}$ where $|z|=2$ [15]
4. Expand $\frac{1}{(z-1)(z-2)}$ about:
 a) $|z| < 1$ b) $1 < |z| < 2$ c) $|z| > 2$ [5+5+5]
- 5.a) Find the image of $1 < x < 2$ under the transformation $w = e^z$.
 b) Find the bilinear mapping which maps the points $z = 1, i, -1$ into $\infty, -i, 0$. [7+8]
- 6.a) Obtain the Fourier series for the function

$$f(x) = \begin{cases} x \sin x & [0, \pi] \\ 2\pi - x \sin x & [\pi, 2\pi] \end{cases}$$

 b) Find the fourier transform of $f(x) = \begin{cases} 1 - |x|, & \text{if } |x| < 1 \\ 0, & \text{if } |x| > 1 \end{cases}$ and hence evaluate $\int_0^\infty \frac{\sin^2 s}{s^2} ds$ [7+8]
- 7.a) Obtain a cosine series for the function $f(x) = \begin{cases} x, & 0 \leq x \leq \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} \leq x \leq \pi \end{cases}$
 b) Find the fourier sine transform of $e^{-|x|}$ and hence evaluate $\int_0^\infty \frac{x \sin mx}{1+x^2} dx$ [7+8]
8. Solve the boundary value problem $u_{tt} = a^2 u_{xx}$ $0 < x < l, t > 0$ with $u(0,t) = 0, u(l,t) = 0$
 $u(x, 0) = 0$ and $u_t(x, 0) = \sin^3 \frac{\pi x}{l}$ [15]

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