Code No: 133BD **R16**

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
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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 cosax sinhy 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 ∞, -i, 0. [7+8]

6.a) Obtain the Fourier series for the function

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

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 $f(x)=\begin{cases} x, 0\le x\le \frac{\pi}{2} \\ \pi - x, \frac{\pi}{2}\le x\le \pi \end{cases}$

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 $u_{tt}=a^2u_{xx}$ $0<x<l, t>0$ 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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