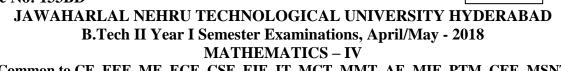
Code No: 133BD



(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, 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

		(23 Walks)
1.a)	Show that $u = \frac{x}{x^2 + y^2}$ is harmonic	[2]
b)	Write Cauchy-Riemann equations in polar form.	[3]
c)	Expand $f(z) = sinz$ in Taylor's series about $z = \frac{\pi}{4}$	[2]
d)	Find residue of $f(z) = \frac{z}{z^2 + 1}$ at its poles	[3]
e)	Find image of the circle $ z = 2$ under the transformation $w = z + 3 + 2i$	[2]
f)	Determine the region of w-plane into which the region is mapp	-
	transformation $w = z^2 z - 1 = 2$.	[3]
g)	Find the value b_n of the Fourier series of the function $f(x) = x^2 - 2$, when -	$-2 \le x \le 2$
		[2]
h)	Find the Fourier sine transformation of $2e^{-5x} + 5e^{-2x}$	[3]
i)	Classify the equation $3\frac{\partial^2 u}{\partial x^2} + 6\frac{\partial^2 u}{\partial x^2} + 4\frac{\partial^2 u}{\partial x \partial y} - 2\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} - 4 = 0$	[2]
j)	Write the one dimensional Heat equation in steady state.	[3]
PART-B		

(50 Marks)

(25 Marks)

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2.a) Discuss the continuity of
$$f(x, y) = \begin{cases} \frac{2xy(x+y)}{x^2 + y^2}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0) \end{cases}$$

b) Construct the analytic function f(z), whose real part is $e^x \cos y$. [5+5]

OR

- 3.a) If f(z) = u + iv is an analytic function of z and if $u v = e^{x}(cosy siny)$ find f(z) in terms of z
- b) if u(x, y) and v(x, y) are harmonic functions in a region R, Prove that the function $\left(\frac{\partial u}{\partial y} \frac{\partial v}{\partial x}\right) + i\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}\right)$ is an analytic function. [5+5]

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- 4.a) Evaluate $\int_{c} (x-2y)dx + (y^2 x^2)dy$ where c is the boundary of the first quadrant of the circle $x^2 + y^2 = 4$
 - b) Evaluate $\int_{c} \frac{1}{z^{8}(z+4)} dz$, where c is the circle |z| = 2. [5+5]

OR

5.a) Obtain the expansion for $sin\left[\frac{1}{z-1}\right]$ which is valid in $1 < |z| < \infty$

b) Evaluate
$$\int_{c} \frac{(2z+1)}{z^{8}(4z^{3}+z)} dz$$
 over a unit circle C. [5+5]

6. Prove that
$$\int_0^{2\pi} \frac{\sin^2 \theta}{a+b \cos \theta} d\theta = \frac{2\pi}{b^2} \left[a - \sqrt{a^2 - b^2} \right], a > b > 0$$
 [10]
OR

- 7. Find the bilinear transformation that maps the points 1, i, -1 into the points 2, i, -2 respectively. [10]
- 8.a) Obtain the Fourier series for the function $f(x) = |\sin x|$ in $(-\pi, \pi)$
 - b) Find Fourier Sine transformation of $e^{-|x|}$ and hence evaluate $\int_0^\infty \frac{x \sin(\alpha x)}{1+x^2} dx$ [5+5]
- 9.a) Find the Half range cosine series for f(x) = x(2-x) in $0 \le x \le 2$

b) Find the inverse Fourier sine transform of $F_s(p) = \frac{e^{-ap}}{p}$ [5+5]

10. Show that the differential equation $\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ for the conduction of heat along a rod Without radiation, subject to the following conditions: a) u is not infinite for $t \to \infty$ b) $\frac{\partial u}{\partial x} = 0$ for x = 0 and x = lc) $u = lx - x^2$ for t = 0 and x = l. [10] OR

11.a) Solve by the method of separation of variables $\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$ b) Solve by the method of separation of variables $4 \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$, given that $u = 3e^{-y} - e^{-5y}$ when x = 0. [5+5]

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