Code No: 123AH **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, May/June - 2019
MATHEMATICS – III
(Common to EEE, ECE, EIE, ETM)

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

(25 Marks)

1.a) Determine the nature of the point $x = 0$ for the equation $(x^2+1)y'' + (x^2-1) + 2y = 0$ [2]

b) Find the indicial equation of $x^2y'' - 2xy' - (x^2-2)y = 0$. [3]

c) Write the value of $J_{\frac{1}{2}}(x)$ [2]

d) Obtain the value of $P_2(x)$. [3]

e) Write the Cauchy Riemann equations in polar form. [2]

f) Show that the function $f(z) = \sin x \cosh y + i \cos x \sinh y$ is continuous and analytic everywhere. [3]

g) Define essential singularity. [2]

h) Expand $\log z$ by Taylor's series about $z = 1$. [3]

i) Find the image of z=2-i under the transformation $w = z + 2 - 3i$. [2]

j) Prove that $w = \frac{1}{z}$ is circle preserving. [3]

PART-B

(50 Marks)

2. Find the series solution of $4xy'' + 2y' + y = 0$. [10]

OR

3. Solve the equation $3x\frac{d^2y}{dx^2} + (1-x)\frac{dy}{dx} - y = 0$ in power series. [10]

4.a) Prove that $\int_{-1}^{1} xP_n(x)P_{n-1}(x)dx = \frac{2n}{4n^2-1}$.

b) Show that $J_0^2 + 2(J_1^2 + J_2^2 + J_3^2 + \cdots) = 1$. [5+5]

OR

5. If m_1, m_2 are roots of $J_n(x) = 0$, then prove that $\int_0^1 xJ_n(m_1x)J_n(m_2x)\,dx = 0$. [10]

6. State and prove Cauchy's Integral formula. [10]

OR

7. Evaluate $\int_c (y - x - 3x^2 i)dz$, where c consists of the line segments from $z = 0$ to $z = i$ and the other from $z = i$ to $z = 1+i$. [10]

8. Evaluate $\int_{-\infty}^{\infty} \frac{z^2-z+2}{z^4+10z^2+9} dz$. [10]

OR

9. Find Laurent expansion of $\frac{1}{z^2-4z+3}$ for $1 < |z| < 3$. [10]

10. Determine the region of the w – plane into which the first quadrant of z – plane is mapped by the transformation $w = z^2$. [10]

OR

11. Show that every bilinear transformation maps the circles in the z – plane onto the circles in the w – plane. [10]

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