

Code No: 123AH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B.Tech II Year I Semester Examinations, April/May - 2018****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) Find the particular integral of $x^2 \frac{d^2y}{dx^2} - 6x \frac{dy}{dx} + 10y = x^2$. [2]
- b) Find the singular points of the differential equation $x^3(x-1) \frac{d^2y}{dx^2} + 2(x-1) \frac{dy}{dx} + y = 0$. [3]
- c) Prove that $P'_n(1) = \frac{1}{2}n(n+1)$. [2]
- d) Express $J_3(x)$ in terms of J_0 and J_1 . [3]
- e) Find the analytic function whose real part is xy . [2]
- f) Evaluate $\int_0^{1+i} (x^2 - iy) dz$ along the path $y = x^2$. [3]
- g) Find the zeros of the function $\sin\left(\frac{1}{z}\right)$. [2]
- h) Show that the function e^z has an essential singularity at $z = \infty$. [3]
- i) Find the fixed points of the transformation $w = \frac{z-1+i}{z+2}$. [2]
- j) Find the points at which $w = \cosh z$ is not conformal. [3]

PART-B**(50 Marks)**

2. Solve the equation in series $x^2 y'' + xy' + (x^2 - 4)y = 0$. [10]
OR
3. Solve $(x+a)^2 \frac{d^2y}{dx^2} - 4(x+a) \frac{dy}{dx} + 6y = x$ [10]
4. State and prove the generating function for $P_n(x)$. [10]
OR
- 5.a) Prove that $(n+1)P_{n+1}(x) = (2n+1)xP_n(x) - nP_{n-1}(x)$.
b) Prove that $\frac{d}{dx}(J_0(x)) = -J_1(x)$. [5+5]
6. State and prove Cauchy's integral formula. [10]
OR
7. Verify Cauchy's theorem for the integral of z^3 taken over the boundary of the rectangle with vertices $-1, 1, 1+i, -1+i$. [10]

8. State and prove Laurent series for the function $f(z)$. [10]

OR

9. Evaluate $\int_0^{2\pi} \frac{\sin^2 \theta}{a + b \cos \theta} d\theta$; ($a > b > 0$). [10]

10. Find the bilinear transform which maps the points $z = 0, -i, -1$ into the points $w = i, 1, 0$.
Find the image of the line $y = mx$ under this transformation. [10]

OR

11. Determine the region of the w -plane into which the region bounded by $\frac{1}{2} \leq x \leq 1$ and $\frac{1}{2} \leq y \leq 1$ is mapped under the transformation $w = z^2$. [10]

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