Code No: 113AH **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, February/March - 2016

MATHEMATICS – III

(Common to EEE, ECE, EIE, ETM, AGE)

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) Prove that x=2 is a regular singular point for the differential equation $x(2-x)y''-2(x-1)y'+2y=0$ [2]

b) Find the particular integral of $x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}+8y=x^3$ [3]

c) Evaluate $\int_{-1}^{1}P_0(x)dx$ [2]

d) Prove that $J_0(0)=1$ [3]

e) Find the value of a if cosax sinhy is harmonic. [2]

f) Find the points at which $f(z)=\frac{z}{(z^2-z)}$ is not analytic. [3]

g) Find the residue of $\frac{2z+3}{z^2-z-2}$ at z = - 1 [2]

h) Expand $z\cos\frac{1}{z}$ [3]

i) The fixed points of f(z) are the points where f(z) =z [2]

j) Find the critical points of $w = \sin z$ [3]

PART-B **(50 Marks)**

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

OR

3. Solve the differential equation in series. $\frac{d^2y}{dx^2}+xy=0$ [10]

4.a) Prove that $J_{n-1}=\frac{2}{x}(nJ_n-(n+2)J_{n+2}+(n+4)J_{n+4}+\ldots)$

b) Express x^2-3x+4 in terms of Legendre Polynimials [5+5]

OR

5.a) Prove that $\frac{d}{dx}[x^{-n}J_n(x)]=-x^{-n}J_{n+1}(x)$

b) Express x^2-4x+7 in terms of Legendre Polynimials. [5+5]

6.a) Find an analytic function whose real part is $e^{-x}(x \operatorname{Sin} y - y \operatorname{Cos} y)$

b) Evaluate the integral , $\int_C \frac{\sin^2 z}{(z - \frac{\pi}{6})^3}$ where $C : |z| = 1$ [5+5]

OR

7.a) Find the analytic function whose real part is $e^{2x}(x\cos 2y - y\sin 2y)$

b) Evaluate $\int_C \frac{(z^3 - z)dz}{(z-2)^3}$ where C is $|z| = 3$ [5+5]

8. Expand $\frac{1}{z^2 - 3z + 2}$

a) $|z| > 2$ b) $1 < |z| < 2$ [5+5]

OR

9. Find the residue at the singular points of the function $\frac{z^2}{(z-1)^2(z+2)}$. [10]

10.a) Find the image of $1 < x < 2$ under the transformation $w = \frac{1}{z}$

b) Find the bilinear mapping which maps the points z=1,i, -1 into 0, 1, ∞. [5+5]

OR

11.a) Find the image of the infinite stripe $\frac{1}{4} \le y \le \frac{1}{2}$ under the mapping $w = \frac{1}{z}$

b) Find the image of $|z| < 1$ *and* $|z| > 1$ under the transformation $W = \frac{iz+1}{(z+i)}$ [5+5]

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