Code No: 123AH **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, November/December - 2016

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) Solve $(x^2D^2+xD-4)y=0$. [2]

b) Find the particular solution of $4x^2\left(\frac{d^2y}{dx^2}\right)+8x\left(\frac{dy}{dx}\right)+y=\frac{4}{\sqrt{x}}$. [3]

c) Express x^2-1 in terms of $P_n(x)$. [2]

d) Express J_2 in terms of J_0 and J_1. [3]

e) Show that $f(z) = z\,|z|$ is not analytic anywhere. [2]

f) Find the harmonic conjugate of $u = 2xy + 3y$. [3]

g) Expand $\frac{1}{(z+1)}$, when z >1. [2]

h) Find the co-efficient of z^3 in the expansion of $\frac{1}{z^2(1-z)}$. [3]

i) Evaluate the residue of $\frac{e}{z^2(z^2+9)}$ at $z = 0$. [2]

j) Find the image of $c < y < d$ under the transformation $w = e^z$. [3]

PART-B

(50 Marks)

2. Solve in series $3x^2\left(\frac{d^2y}{dx^2}\right)+x\left(\frac{dy}{dx}\right)+y=x$. [10]

OR

3. Solve $(1+x)^2\left(\frac{d^2y}{dx^2}\right)+(1+x)\left(\frac{dy}{dx}\right)+y=4\cos\log(1+x)$. [10]

4.a) Prove that $\cos(x\cos\theta) = J_0 - 2J_2\cos 2\theta + 2J_4\cos 4\theta$-----

b) Prove that $\sin(x\cos\theta) = 2J_1\cos 3\theta + 2J_5\cos 5\theta - - -$. [5+5]

OR

5. Show that $\int_{-1}^{1} p_m(x)p_n(x)\,dx = \begin{cases} 0 & if\ m \neq n \\ \frac{2}{2n+1} & if\ m = n \end{cases}$. [10]

6.a) Find the analytic function whose real part is $\left(r - \frac{1}{r}\right)\sin\theta$.

b) Evaluate $\int_c x^2 y\,dx + (x^2 - y^2)\,dy$ form (0,0) to (1,3) along $y=x^2$. [5+5]

OR

7. If $F(a) = \int_c \frac{(3z^2 + 7z + 1)}{(z-a)}dz$ using cauchy's integral formula where C is $|z| = 2$.

Find F(1), F(3) $F''(1-i)$. [10]

8. Expand $\frac{z}{(z+1)(z-3)}$ where (a) $c: |z| > 3$ (b) $c: |z| < 1$. [10]

OR

9. Expand $f(z) = \frac{z+3}{z(z^2 - z - 2)}$ in power of z

(a) $c: 0 < |z| < 1$ (b) $c: 1 < |z| < 2$ (c) $c: |z| > 2$. [10]

10.a) Prove that under the transformation w=1/z, the image of the lines y= x-1 and y=0 are the circle $u^2 + v^2 - u - v = 0$ and the line v=0, respectively.

b) Find the bilinear transformation which maps the points $(-1,\infty,1)$ to $(-1,-2,i)$. [5+5]

OR

11.a) Find the image of the triangle with vertices i,1+i and 1 in Z-plane under the transformation w=3z+4-2i. [5+5]

b) Show that the transformation $w = \frac{5-4z}{4z-2}$ transforms the circle $|z| = 1$ into a circle of radius unity in w-plane and find the centre of the circle. [5+5]

---ooOoo---