**(DEE 221)**

# B. Tech. DEGREE EXAMINATION, MAY - 2015

## (Examination at the end of Second Year)

## ELECTRICALS AND ELECTRONICS ENGINEERING

## Paper - I : Mathematics - IV

**Time : 3 Hours** **Maximum Marks : 75**

***Answer question No. 1 compulsory*** *(15)*

***Answer ONE question from each unit*** *(4 x 15 = 60)*

*1)* a) Define analytic function.

b) Write C – R equations.

c) Define pole.

d) Write statement Cauchy Integral theorem.

e) Define Poisson's integral formula.

f) Define Laurent's series.

g) Determine the poles of $f(z) = \frac{1}{z^3(z-1)^2}$

h) State Residue theorem.

i) Define legendre polynomial.

j) Define orthogonal system.

k) Write the orthogonal property of Bessel function.

l) Define Taylor's series.

m) Define poles.

n) Write the expression for $p_2\ (x)$.

o) Write the orthogonal property of Bessel function.

## Unit – I

**2)** a) Determine the regular function whose imaginary part is $\left(\frac{x-y}{x^2+y^2}\right)$.

b) Find the orthogonal trajectories of the family of curves $x^4 + y^4 - 6x^2y^2 = c$

OR

**3)** a) If both $f(z)$ and $f'(z)$ are analytic show that $f(z)$ is constant.

b) Show that for $f(z) = \begin{cases} \frac{2xy(x+iy)}{x^2+y^2} & if\ z \neq 0 \\ 0 & if\ z = 0 \end{cases}$

The Cauchy – Riemann equations satisfied at origin but derivate of $f(z)$ at origin does not exists.

## Unit – II

**4)** a) State and prove Cauchy integral formula.

b) Find the Laurent series of $f(z) = \frac{e^z}{z(1-z)}$ about z = 1 and find region of convergence.

OR

**5)** a) Evaluate $\oint_c \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)}$ dz where c is a circle |z| = 3.

b) Find the Taylor's series expansion of $f(z) = \frac{\partial z^3 + 1}{z^2 + 2}$ about $z_0 = i$.

## Unit – III

**6)** a) State and prove Cauchy's residue theorem.

b) Find the residue of $\frac{e^z}{z^2(z^2+9)}$ at its poles.

OR

**7)** a) Evaluate $\oint_c \tan z\, dz$ where c is $|z| = 2$.

b) Use contour integration technique to find the value of $\int_0^{2\pi} \frac{d\theta}{2+\cos\theta}$.

## Unit – IV

***8)*** Prove that $\sqrt{3/2}^{(x)} = \sqrt{\left(\frac{2}{\pi x}\right)} \left\{ \frac{3-x^2}{x^2} \sin x - \frac{3}{x} \cos x \right\}$

OR

***9)*** Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomials.

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