(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : **199419**

Roll No.

B. Tech.

(SEM. IV) THEORY EXAMINATION, 2014-15

ENGG MATHEMATICS - III

Time : **3** Hours]   [Total Marks : **100**

Note: Attempt all questions from each Section as indicated. The symbols have their usual meaning.

1   Attempt any FOUR parts of the following: (5×4=20)

(a)   Using C – R equations show that $f(z) = |z|^2$ is not analytical at any point.

(b)   State Cauchy's integral formula. Hence evaluate:

$$\int_c \frac{2z+1}{z^2+z}\, dz \qquad \text{where C is } |z| = \frac{1}{2}.$$

(c)   Expand $\dfrac{1}{Z^2 - 3Z + 2}$ in the region $1 < |z| < 2$.

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

(e)   Evaluate the integral:

$$\int_0^{2\pi} \frac{d\theta}{5 - 3\cos\theta}$$

(f)   Determine the poles of the following function and residue at each pole:

$$f(z) = \frac{z^2}{(z-1)^2(z+2)}$$

and hence evaluate

$$\int_c f(z)\,dz, \quad \text{where } C:|z| = 3.$$

2   Attempt any TWO parts of the following: (10×2=20)

(a)   Find the Fourier cosine transform of $\dfrac{1}{1+x^2}$ and hence

find Fourier sine transform of $\dfrac{x}{1+x^2}$.

(b)   Find the inverse Z-transform of:

$$f(z) = \frac{3z^2 - 18z + 26}{(z-2)(z-3)(z-4)}$$

(c)   Solve the following difference equation:

$$y_{k+2} + 4y_{k+1} + 3y_k = 3^k ; \text{ given } y_0 = 0 \text{ and } y_1 = 1.$$

3   Attempt any TWO parts of the following: (10×2=20)

(a)   Using the method of least square fit a curve of the form $y = a\,b^x$ to the following data:

X	2	3	4	5	6
Y	8.3	15.4	33.1	65.2	127.4

(b)   Find the mean and variance of Binomial distribution.

(c)   The first four moments of a distribution about x = 4 are 1, 4, 10 and 45. Calculate the moments about the mean and comment upon the Skewness and Kurtosis of the distribution.

4   Attempt any TWO parts of the following: (10×2=20)

(a)   Using Newton-Raphson method, find real root of equation $3x - \cos x - 1 = 0$ correct up to four decimal places. Also find the order of convengence of the method.

(b)   From the given data

X	4	5	7	10	11	13
f(x)	48	100	294	900	1210	2028

find the polynomial in x and hence find the value of $f(8)$.

(c)   Estimate from the following table the number of students who obtained marks between 40 and 45:

Marks	30–40	40–50	50–60	60–70	70–80
No. of Students	31	42	51	35	31

5   Attempt any TWO parts of the following: (10×2=20)

(a)   Apply Gauss - Seidal Method to solve the equations (three iterations) :

$2x+10y+z = 55$

$10x+y+2z = 44$

$x+2y+10z = 61$

(b)   Find $\int\limits_{0}^{6} \dfrac{e^x}{1+x} \, dx$ approximately using Simpson's $\dfrac{1}{3}$ rule

and Simpson's $\dfrac{3}{8}$ rule, dividing the range into 6 equal parts.

(c)   Given the initial value

problem $\dfrac{dy}{dx} = 1 + y^2$; $y(0) = 0$.   Find

$y(0.2), \, y(0.4)$ by Runge - Kutta fourth - order.