

**B.Tech. (Main & COP)**  
**Fourth Semester Theory Examination 2016-17**  
**Mathematics-III**

Time: 3 Hours

Total Marks: 100

Note Attempt all questions.

1. Attempt any four parts of the following: (5x4=20)

(a) Determine analytical function  $f(z)$  in terms of  $z$  whose imaginary part is  $e^x(x \cos y - y \sin y)$ .

(b) Evaluate the following integral using Cauchy integral formula

$$\int_C \frac{(4-3z)}{z(z-1)(z-2)} dz \text{ where } C \text{ is circle. } |z| = \frac{3}{2}$$

(c) Expand  $\frac{1}{z^2 - 3z + 2}$  in the region (a)  $|z| < 1$  (b)  $1 < |z| < 2$ 

(d) State Cauchy's Residue theorem and find residue of

$$\int_C \frac{(12z-7)}{(z-1)^2(2z+3)} dz \text{ where } C \equiv |z| = 2$$

(e) Using complex integration method, evaluate  $\int_0^{2\pi} \frac{1}{5-3\cos\theta} d\theta$ (f) Show that the function defined by  $f(z) = \sqrt{|xy|}$  satisfies Cauchy-Riemann equation at origin but is not analytic at origin.

2. Attempt any two parts of the following: (10x2=20)

(a) State and prove convolution theorem on Fourier transformation.

(b) Find Fourier Cosine Transform of  $1/(1+x^2)$  and hence find Fourier Sine Transform of  $x/(1+x^2)$ .

(c) Solve differential equation by Z-transformation.

$$6y_{k+2} - y_{k+1} - y_k = 0, y(0) = 0, y(1) = 1$$

3. Attempt any four parts of the following: (5x4=20)

(a) By the method of least square, find the straight line that best fit the following data:



X	1	2	3	4	5
Y	14	27	40	55	68

(b) Use Lagrange's interpolation formula to compute  $y(2.5)$ , from the following data :

X	1	2	3	4
Y	1	8	27	64

(c) Starting with  $x_0 = 1$ , find the real roots of  $x^3 - 5x + 3 = 0$ , correct to three decimal places, using Newton-Raphson method.

(d) Find a positive roots of  $x^3 - 4x + 1 = 0$  by the method of Regula Falsi method, lying between 0 and 1.

(e) Find the missing value in the following data:

x	0	1	2	3	4
y	1	3	9	-	81

(f) Using Newton's forward interpolation, find the value of  $y(5)$ .

X	0	2	4	6	8
Y	5	9	61	209	501

4. Attempt any two parts of the following: (10x2=20)

(a) Calculate the first four moment of the following distribution about the mean hence find the coefficient of the skewness and Kurtosis.

Class-interval	0-10	10-20	20-30	30-40	40-50	50-60
frequency	1	6	10	15	11	7

(b) Find the coefficient of correlation and regression lines to the following data:

x	2	4	6	8	10
y	5	7	9	8	11

(c) (i) State and prove the recurrence formula for Poisson distribution.



(ii) Find out the mean and standard deviation of Binomial distribution.

5. Attempt any two parts of the following: (10x2=20)

(a) Solve the equation  $dy/dx = y - x$  with initial condition  $y(0) = 2$ , by Runge-Kutta fourth order method to find  $y(0.2)$  with  $h = 0.1$ .

(b) Evaluate  $\int_0^1 \frac{2x}{1+x^2} dx$  by using Simpson's (1/3) rule, by dividing the interval into four equal parts.

(c) Solve the following system of equation by Gauss-Seidel method correct to two places of decimal.

$$3x + y + 2z = 6$$

$$-x + 4y + 2z = 5$$

$$2x + y + 4z = 7$$