

Paper Id: 199221Roll No. 

**B. TECH.**  
**(SEM-IV) THEORY EXAMINATION 2018-19**  
**MATHEMATICS-III**

*Time: 3 Hours**Total Marks: 100***Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief. 2 x 10 = 20**

- a. Write Cauchy integral theorem for multiply connected region.
- b. Define removable singular points with example.
- c. Define the coefficients of Skewness.
- d. Write the normal equations to  $y = ax + \frac{b}{x^2}$ .
- e. Out of 800 families with 5 children each, how many would you expect to have 5 girls.
- f. Define Control Charts.
- g. Isolate the roots of the equation  $x^3 - 4x + 1 = 0$ .
- h. Differentiate between order and rate of convergence of an iterative method.
- i. Write Euler's formula for solving ordinary differential equation.
- j. Write the conditions when LU decomposition method does not work.

**SECTION B****2. Attempt any three of the following: 10 x 3 = 30**

- a. Write the Laurent's expression for  $f(z) = \frac{7z-2}{z^3 - z^2 - 2z}$  in the regions.  
 (i)  $0 < |z+1| < 1$       (ii)  $1 < |z+1| < 2$       (iii)  $3 < |z+1|$
- b. Using least square method, fit a second degree polynomial from the following data:

x	0	1	2	4	5	6	7	8	9
y	12.0	10.5	10.0	8.0	7.0	8.0	7.5	8.5	9.0

- c. The 9 items of a sample have the following values:  
 45, 47, 50, 52, 48, 47, 49, 53, 51.  
  
 Does the mean of these values differ significantly from the assumed mean 47.5?
- d. Show that the Newton-Raphson Method has second order convergence.
- e. Use fourth order Runge -Kutta method to find  $y(0.2)$ , Given  $\frac{dy}{dx} = 1 + y^2; y(0) = 0$ .

## SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Using calculus of residue, evaluate the following integral  $\int_0^{\infty} \frac{dx}{(a^2 + x^2)^2}$ .
- (b) Determine the analytic function  $f(z) = u + iv$ , in terms of  $z$ , whose  $u - v = e^x(\cos y - \sin y)$ .

4. Attempt any *one* part of the following: 10 x 1 = 10

If the  $\theta$  is the acute angle between the two regression lines in the case of two

- (a) variables  $x$  and  $y$ , show that  $\tan \theta = \frac{1-r^2}{r} \cdot \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$  where  $r, \sigma_x, \sigma_y$  have their usual meanings. Explain the significance of the formula when  $r = 0$  and  $r = -1$ .
- (b) Determine the constants  $a$  and  $b$  by the method of least square such that  $y = ae^{bx}$  fits the following data:

x	2	4	6	8	10
y	4.077	11.084	30.128	81.897	222.62

5. Attempt any *one* part of the following: 10 x 1 = 10

- (a) The following table gives the number of accidents that took place in an industry during various days of the week. Test if accidents are uniformly distributed over the week:

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Number of Accidents	14	18	12	11	15	14

- (b) Prove that Poission distribution is the limiting case of Binomial distribution.

6. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Find a real root of the equation  $x \log_{10} x = 1.2$  using bisection method correct up to three decimals places.
- (b) Population of a town as given:

Years(x)	1891	1901	1911	1921	1931
Population(y)	49	60	88	99	120

Estimate the population for the year 1894.

7. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Solve the system of equations using crout's method.  
 $2x + 3y + z = 9, x + 2y + 3z = 6, 3x + y + 2z = 8$ .
- (b) Compute  $\int_0^6 \frac{dx}{1+x^2}$  using Simpson's 3/8 rule.