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**B. TECH**  
**(SEM-III) THEORY EXAMINATION 2019-20**  
**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**
- Find the residue of  $f(z) = z \cos \frac{1}{z}$  at  $z=0$ .
  - Define Analytic function.
  - State modulation theorem for fourier transform.
  - Find the Z transform of  $\sin k$   $k \geq 0$ .
  - Define coefficient of skewness.
  - Define marginal and conditional distribution.
  - Prove that zero operator is linear operator.
  - Define subgroup with example.
  - Define rate of convergence in bisection method.
  - Write the formula of Newton's cotes quadrature formula.

**SECTION B**

- 2. Attempt any three of the following: 10x3=30**
- Apply calculus of residues to prove that  $\int_0^{\infty} \frac{\cos x}{1+x^2} dx$ .
  - Find the Fourier Cosine Transform of  $\frac{1}{1+x^2}$
  - Show that Poisson distribution is a limiting form of binomial distribution.
  - Show that the set  $S = \{(1,0,0), (1,1,0), (1,1,1), (0,1,0)\}$  span the vector space  $\mathbb{R}^3$  but is not a basis set.
  - Using Crout's method to solve the following system of equations:  
 $3x+2y+7z=4; 2x+3y+z=5; 3x+4y+z=7$ .

**SECTION C**

- 3. Attempt any one part of the following: 10x1=10**
- Show that  $f(z) = |z|^2$  is not analytic at  $z=0$ , although Cauchy –Riemann equations are satisfied at that point.
  - Find the Taylor's and Laurent's series which represents the function  
 $f(z) = \frac{z^2-1}{(z+2)(z+3)}$  in the regions (i)  $|z| < 2$  (ii)  $2 < |z| < 3$  (iii)  $|z| > 3$
- 4. Attempt any one part of the following: 10x1=10**
- Show that the vector  $x_1=(1,0,-1)$ ,  $x_2=(1,2,1)$ ,  $x_3=(0,3,-2)$  form a basis for  $\mathbb{R}^3$ . Express each of the standard basis vector as a linear combination of  $x_1, x_2, x_3$ .
  - Find a maximal linearly independent subsystem of the system of vector  $x_1=(2,-2,-4)$ ,  $x_2=(1,9,3)$ ,  $x_3=(-2,-4,1)$  and  $x_4=(3,7,-1)$

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5. Attempt any *one* part of the following:

10x1=10

- a. Calculate the value of  $\beta_2$  for the following distribution:

Class	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	1	20	69	108	78	22	2

- b. The following data regarding the heights (y) and weight (x) of 100 college students are given  $\sum x = 15000$ ,  $\sum x^2 = 2272500$ ,  $\sum y = 6800$ ,  $\sum y^2 = 463025$  and  $\sum xy = 1022250$ . Find the equation of regression line of height on weight.

6. Attempt any *one* part of the following:

10x1=10

- a. The union of two subspaces of a vector space is its subspace iff one is contained in the other.
- b. Prove that the vector  $(1,2,1), (2,1,0), (1,-1,2)$  form a basis of  $\mathbb{R}^3$ .

7. Attempt any *one* part of the following:

10x1=10

- a. Use Runge-Kutta method to find  $y(1.2)$  in step size  $h=0.1$  given that  $\frac{dy}{dx} = x^2 + y^2$  with  $y(1)=1.5$ .
- b. Compute the rate of convergence of Newton Raphson Method.