



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B TECH
(SEM-III) THEORY EXAMINATION 2020-21
MATHEMATICS-III

Time: 3 Hours

Total Marks: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief.

2 x 7 = 14

- Show that the function $f(z) = x^2 - y^2$ is harmonic function.
- Define the Poisson distribution with mean and variance.
- Write the normal equation for the curve $y = \frac{a}{x} + b\sqrt{x}$.
- Prove that $e^x = \left(\frac{\Delta^2}{E}\right) e^x \cdot \frac{E e^x}{\Delta^2 e^x}$
- Write the relation between n^{th} divided difference and n^{th} forward difference.
- What do you mean by initial value problem?
- Find $Z^{-1}\left(\frac{5}{5z-1}\right)$

SECTION B

2. Attempt any three of the following:

7 x 3 = 21

- State and prove the Cauchy Integral formula. Also evaluate $\int_C \frac{4-3z}{z(z-1)(z-2)} dz$, where C is the circle $|z| = 3/2$,
- In a partially distributed laboratory record of an analysis of a correlation data, the following result are legible:
Variance of $x = 9$
Regression equation: $8x - 10y = 66$ and $0.40x - 18y = 214$.
What were (a) the mean of x and y . (b) the standard deviation of y and the coefficient of x and y :
- Decompose $A = \begin{bmatrix} 5 & -2 & 1 \\ 7 & 1 & -5 \\ 3 & 7 & 4 \end{bmatrix}$ in the form LU, where L is lower triangular matrix and U is upper triangular matrix and hence solve the system of equations:
$$\begin{aligned} 5x - 2y + z &= 4 \\ 7x + y - 5z &= 8 \\ 3x + 7y + 4z &= 10. \end{aligned}$$
- If $F_c(p) = \frac{1}{2} \tan^{-1} \frac{2}{p^2}$, then find $f(x)$.
- Given the initial value problem $\frac{dy}{dx} = x^3 - y^3$, $y(0) = 1$.
Find the numerical solution of differential equation at $x = 0.6$ with $h = 0.2$ by using Runge-Kutta method of Fourth order.

SECTION C

3. Attempt any one part of the following:

7 x 1 = 7

- Evaluate the contour integration: $\int_0^{2\pi} \frac{1}{a+b \sin \theta} d\theta$, where $a > |b|$.
- Determine the analytic function $f(z) = u + iv$, in terms of z whose real part is $e^x(x \cos y - y \sin y)$

4. Attempt any one part of the following:

7 x 1 = 7

- Find Fourier cosine transform of $\frac{1}{1+x^2}$ and hence find Fourier sine transform of $\frac{x}{1+x^2}$.
- Solve by Z-transform the differential equation $y_{k+2} + 6y_{k+1} + 9y_k = 2^k$; ($y_0 = y_1 = 0$).



Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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

7 x 1 = 7

- (a) Show that Poisson distribution is a limiting case of Binomial distribution when p is very small and n is very large. Also find the mean and variance of the Poisson distribution.
- (b) Find the mean and variance of normal distribution.

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

7 x 1 = 7

- (a) Write the order of convergence of an iterative method. Prove that rate of convergence of Newton Raphson method is quadratic.
- (b) State and prove the Lagrange interpolation formula. Find the interpolating polynomial by By Lagrange interpolation formula for the given data.

x	5	6	9	11
y	12	13	14	16

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

7 x 1 = 7

- (a) State and prove Simpson one third rule and Evaluate $\int_0^2 \frac{1}{x^2+x+1} dx$ using Simpson's rule with eight intervals.
- (b) Find x for which y is maximum and find the max value of y

x	1.2	1.3	1.4	1.5	1.6
y	0.9320	0.9636	0.9855	0.9975	0.9996