PAPER ID-411556

Roll No:

BTECH
(SEM III) THEORY EXAMINATION 2021-22
MATHEMATICS-III

[Time: 3 hours] [Max Marks:100]

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

SECTION A

1. **Attempt all questions of this section. Each section carry equal marks.** (2x10=20)
   (a) Write Cauchy's Riemann equations in Cartesian coordinate system.

   (b) State convolution theorem on Fourier transformation.

   (c) Find Z- transform of unit step function.

   (d) Write the normal equations to fit a curve y=a+bx by least square method.

   (e) If the regression coefficient are given $b_{xy} = -0.2$ and $b_{yx} = -0.8$ then determine correlation coefficient.

   (f) For poison distribution if mean $(m) = 3$ what will be value of $P(1)$.
   (g) Find the missing data in the given table:

x	0	1	2	3
F(x)	580	556	-	465

   (h) Calculate the third divided difference with arguments 2, 4, 9, 10 of the function $f(x) = x^3 - 2x$.
   (i) Write the Newton's Raphson iterative to find the value of $\sqrt{N}$.
   (j) Write Picard's formula for solving ordinary differential equation.
   .

SECTION B

2. **Attempt any five questions from this section:** (10x5=50)

   (a) State and prove Cauchy's Integral formula and evaluate $\int_c \frac{e^z}{(z+1)^2} dz,$ where C is the circle $|z| = 4$.

   (b) Find the inverse Z-transform of $\dfrac{3z^2 - 18z}{(z-4)(z-3)(z+5)}$

   (c) Find a positive value of $(17)^{\frac{1}{3}}$ correct to four decimal places by Newton's- Raphson Method.

   (d) Using least square method, fit a curve of the form $y = ab^x$ to the following data.

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	127.4

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(e) Apply Simpson's 3/8 formula to evaluate $\int_0^6 \dfrac{1}{2+x^2}\,dx$.

(f) Apply Lagrange's interpolation formula to find the Interpolating polynomial for the data.

x	0	1	2	5
f(x)	2	3	12	147

(g)
Solve the system of equations using Gauss Seidel method.
    2x+10y+z=51, 10x+y+2z=44, x+2y+10z=61.

(h) Use fourth order Runge –Kutta method to find y(0.2) solving $\dfrac{dy}{dx} = x+y$ y(0)=0.

SECTION C
Note: Attempt any two questions from this section. Each section carry equal marks (15x2=30)

3. (a) Show that the function $u = e^{-2xy}\sin(x^2 - y^2)$ is Harmonic. Find the conjugate v and express u + iv as an analytic function of z.

(b) Using calculus of residue, evaluate the following integral $\int_0^\infty \dfrac{dx}{(a^2 + x^2)}$

(c) Show that the Fourier transform of $\dfrac{e^{-ax}}{x}, a > 0$ is $\tan^{-1}(p/a)$.

4. (a) Solve by Z- transformation: $y_{k+2} - 4y_{k+1} + 3y_k = 3^k$,

(b) The first four moments of a distribution about x=2 are 1 ,4, 19 ,45. Comment on the skewness and Kurtosis of the distribution.

(c) The marks secured by recruiters in the selection test (X) and in the proficient test (Y) are given below

S. No	1	2	3	4	5	6	7	8	9
X	10	15	12	17	13	16	24	14	23
Y	30	42	45	46	33	34	40	35	39

Calculate the rank correlation co-efficient.

5. (a) Find a real root of the following equations by the method of false position correct to four decimal places.
    $3x + \sin x - e^x = 0$

(b) Prove that

(i) $\left(E^{1/2} + E^{-1/2}\right)\left(1+\Delta\right)^{1/2} = 2+\Delta$ (ii) $\Delta + \nabla = \dfrac{\Delta}{\nabla} - \dfrac{\nabla}{\Delta}$.

(c) The table given below reveals the velocity 'v' of a body during the time 't' specified. Find its acceleration at t = 1.1.

t	1.0	1.1	1.2	1.3	1.4
v	43.1	47.7	52.1	56.4	60.8