PAPER ID-421364

Subject Code: RAS401

Roll No: | | | | | | | | | | | | | |

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

Time: 3 Hours ***Total Marks: 70***

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

SECTION A

1. Attempt *all* questions in brief. **2x7 = 14**

a.	Identify the type of singularity of the function $\frac{sinz}{z(z-3)^2}$ at z = 3.
b.	Define harmonic function.
c.	Comment on the statement "There exists a Poisson distribution having mean = 5 and variance =3."
d.	In a certain distribution the first two moments about 4 are found 1.5 and 17. Find mean and variance of the distribution.
e.	State shifting property of complex Fourier transform.
f.	Write Newton's backward interpolation formula.
g.	Solve $a_n - 6a_{n-1} + 9a_{n-2} = 0, n \geq 2, a_0 = 5, a_1 = 12$

SECTION B

2. Attempt any *three* of the following: **7x3 = 21**

a. Evaluate $\oint \frac{e^z dz}{z(1-z)^3}$ for the contour (i) $|z| = 0.5$ (ii) $|z-1| = 0.5$

b. Determine a straight line to the following data

x	1	2	3	4	6	8
y	2.4	3	3.6	5.5	7.1	9.2

c. Find the rate of convergence of Newton Raphson method.

d. A river is 80 feet wide. The depth h in feet at a distance x foot from one bank is given by the following:

x	0	10	20	30	40	50	60	70	80
h	0	4	7	9	12	15	14	8	3

Find approximately the aera $\int_0^{80} h\,dx$ of cross section of the river using Simpson's 1/3rd rule.

e. Find f(x) whose Fourier cosine transform is $\frac{\sin as}{s}$.

SECTION C

3. Attempt any *one* part of the following: **7x1 = 7**

a.	Represent the function $f(z) = \frac{4z+3}{z(z-3)(z+2)}$ in the angular region between $\|z\| = 2$ and $\|z\| = 3$.
b.	Find an analytic function f(z) whose real part is $e^x(xcos\,y - ysin\,y)$.

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4. Attempt any *one* part of the following: 7x1 = 7

a.	If 20% of the bolts produced by a machine are defective, determine the probability that out of 10 bolts chosen at random (i) none (ii) at least one (iii) at most two bolts will be defective.
b.	Calculate the expected frequencies for the following data and check the two attributes, viz., condition of home and condition of the child as independent or not. Use Chi square at 5% level of significance for two degrees of freedom as 5.99

Condition of Home

Condition of child	Clean	Dirty
Clear	70	50
Fairley clean	80	20
Dirty	35	45

5. Attempt any *one* part of the following: 7x1 = 7

a.	Find the polynomial of the lowest degree which assumes the values 3, 12, 15, -21 when x has the values 3, 2, 1, -1.
b.	Compute a real root of the equation $x^3 - 3x - 5 = 0$ using numerical method.

6. Attempt any *one* part of the following: 7x1 = 7

a.	Use Runge-Kutta method to integrate the differential equation $\frac{dy}{dx} = x + y$, y (0) = 0 from x = 0 to 0.4 taking step size h = 0.2 .
b.	Using Gauss-Seidel method solve the following system of equations $5x - y = 9, \quad -x + 5y - z = 4, \quad -y + 5z = -6$ with initial solution (0, 0, 0)

7. Attempt any *one* part of the following: 7x1 = 7

a.	Find the Fourier transform of $f(x) = \begin{cases} \frac{1}{k}, \lvert x\rvert \le k \\ 0, \lvert x\rvert > k \end{cases}$
b.	Apply Z transform to solve $u_{n+2} + 2a_{n+1} + a_n = n,\ u_0 = u_1 = 0$
c.	Using Power method find the largest eigen value and the corresponding eigenvector of the matrix $\begin{bmatrix} -2 & 0 & -1 \\ 1 & -1 & 1 \\ 2 & 2 & 0 \end{bmatrix}$.