Sub Code: NAS301

Paper Id: 199330 Roll No:

B. TECH
(SEM III) THEORY EXAMINATION 2019-20
ENGINEERING 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.	State Cauchy's integral formula for the nth derivative of an analytic function.
b.	Evaluate $\oint \frac{z}{z+1} dz$ along the curve C: $\lvert z\rvert = 2$.
c.	Find the Fourier transform of $e^{-\lvert x\rvert}$
d.	Find the Z transform of a^n, $n \geq 0$.
e.	How can we measure Kurtosis?
f.	Write the formula for rank correlation.
g.	Prove that $E = 1+ \Delta$.
h.	Write Newton's backward interpolation formula.
i.	Write Trapezoidal rule.
j.	Describe Picard's method for solving differential equation.

SECTION B

2. Attempt any *three* of the following: 10x3=30

a.	Given the function $f(z) = \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}$, $z \neq 0$ and $f(0) = 0$, show that the Cauchy-Riemann equations are satisfied at the origin, yet $f'(0)$ does not exist.
b.	Apply appropriate Fourier transform to solve the partial differential equation $\frac{\partial V}{\partial t} = \frac{\partial^2 V}{\partial x^2}; x>0, t>0$ subject to (i) $V_x(0,t) = 0$ (ii) $V(x,0) = \begin{cases} x, 0 \leq x \leq 1 \\ 0, x > 1 \end{cases}$ (iii) $V(x,t)$ be bounded.
c.	If 10 coins are tossed simultaneously and probability of occurrence of head in each of them is .6 then what is the expected number and variance of occurrence of heads and probability of number of heads appears on at least 8 coins.
d.	Using Lagrange's interpolation formula find y(10) from the following table: *x:* 5 6 9 11 *y:* 12 13 14 16
e.	Find $\int_0^6 \frac{e^x}{1+x} dx$ approximately using Simpson's 3/8 rule on integration.

SECTION C

3. Attempt any *one* part of the following: 10x1=10

a.	Find the Laurent's expansion of function $f(z) = \frac{7z-2}{z^3-z^2-2z}$ in the regions given by: (i) $1 < \lvert z+1\rvert < 3$ (ii) $\lvert z+1\rvert > 3$
b.	Apply Calculus of residues to prove that $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+a^2)(x^2+b^2)} dx = \frac{\pi}{a+b}$ $(a > 0, b > 0)$

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4. Attempt any *one* part of the following: 10x1=10

a.	Find the Fourier transform of $F(x) = \begin{cases} 1 - x^2, & \text{if } \lvert x\rvert < 1 \\ 0, & \text{if } \lvert x\rvert > 1 \end{cases}$ and use it to evaluate $\int_0^\infty \left(\frac{x\cos x - \sin x}{x^3}\right) \cos\frac{x}{2}\, dx$.
b.	Find the inverse Z- transform of $F(z) = \frac{1}{(z-3)(z-2)}$ for $(i) 2 < \lvert z\rvert < 3$ $(ii) 3 < \lvert z\rvert$.

5. Attempt any *one* part of the following: 10x1=10

a. Obtain the least square fit of the $f(x) = a + bx + cx^2$ the following data:

x:	0	1	2	3	4
$f(x)$:	1	1.8	1.3	2.5	6.3

b. 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. (Given that χ^2 at 5% level of significance is 11.09)

Day	Mon	Tue	Wed	Thu	Fri	Sat
No.of accidents	14	18	12	11	15	14

6. Attempt any *one* part of the following: 10x1=10

a. Using Newton Raphson method, find the real root of the equation $3x = \cos x + 1$ up to four decimal places.

b. Following are the marks obtained by 492 candidates in a certain examination:

Marks :	0-40	40-45	45-50	50-55	55-60	60-65
No. of candidates	210	43	54	74	32	79

Find out the number of candidates who secured (i) More than 48 but not more than 50 marks. (ii) Less than 48 but not less than 45 marks.

7. Attempt any *one* part of the following: 10x1=10

a. Solve the following system of linear equations using Gauss-Seidel method
l0x + 3y + 7z = 41; 3x + 2oy + l7z = 101; x+19y+23z = 201,
Perform three iterations.

b. Using the fourth order Runge-Kutta method, solve the initial value problem $\frac{dy}{dx} = -2xy^2$; $y(0) = 1$ at $x = 0.2$ with h = 0.1 on the interval [0, 0.3].