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Code No: 154BG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year II Semester Examinations, August/September - 2021

LAPLACE TRANSFORMS, NUMERICAL METHODS AND COMPLEX VARIABLES

(Common to ECE, EIE)

Time: 3 Hours

Max. Marks: 75

**Answer any five questions
All questions carry equal marks**

- 1.a) Find $L\left[\int_0^t te^{-s} \sin 4t dt\right]$
 b) Find $L\left(\frac{s+2}{s^2 - 6s + 8}\right)$. [8+7]

- 2.a) Find a real root of the equation $x \sin x + \cos x = 0$ near $x = \pi$ by Newton's Raphson method.
 b) Find a cubic polynomial in x for the following data using Newton's forward interpolation formula. [8+7]

x	0	1	2	3	4	5
y	-3	3	11	27	57	107

- 3.a) Evaluate $\int_0^1 e^{-x^2} dx$ by taking $h = 0.2$ using (i) Trapezoidal (ii) Simpson's $1/3$ rd rules.

- b) Given that $y' = \frac{y-x}{y+x}$, $y(0) = 1$. Compute $y(0.2)$ and $y(0.4)$ by using the Runge-Kutta 4th order Method, taking $h = 0.2$. [8+7]

- 4.a) Using Lagrange's interpolation formula, find $y(6)$ from the following table:

- b) Given that $y' = x^2 + y^2$, $y(0) = 0$. Compute $y(0.5)$ with $h = 0.1$ Using the Picard's Method. [8+7]

- 5.a) Find the value of 'p', if the function $f(z) = \frac{1}{2} \log(x^2 + y^2) + i \tan^{-1}\left(\frac{px}{y}\right)$ is analytic.

- b) Show that the real part of an analytic function $f(z)$ is harmonic. [8+7]

- 6.a) Evaluate $\oint_C \frac{dz}{(z^2 + 1)(z^2 - 4)}$, $C: |Z| = 1.5$ using Cauchy's integral formula.

- b) Determine the poles and residues of the function $f(z) = \frac{z^2}{(z-1)^2(z+2)}$. [7+8]

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7. By integrating around a unit circle, evaluate $\int_0^{2\pi} \frac{\sin^2 \theta}{5+4\cos \theta} d\theta$. [15]

8. Using Laplace transforms, solve $(D^2 + 2D + 5)y = e^{-t} \sin t$, given $y(0) = 0$, $y'(0) = 1$. [15]

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