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KAMALA INSTITUTE OF TECHNOLOGY & SCIENCE, SINGAPUR
23MA28BS301

II.B. Tech. I. Semester Regular Examinations, Dec. 2024/Jan. 2025
NUMERICAL METHODS AND COMPLEX VARIABLES
(Common to EEE, ECE)

Time: 3 Hours

Max.Marks:60

Note: Question paper consists of Part-A & Part-B.

i) **Part-A** for 10M, ii) **Part-B** for 50marks

- Part A** is compulsory, consists of 10 sub questions from all units carrying equal marks.
- Part-B** consists of **10 questions** (numbered from 2 to 11) carrying **10marks** each. From each unit there are 2 questions and the students should answer one of them. Hence the student should answer **5 questions** from **Part-B**.

PART-A		(10Marks)	
Q.No	Questions	Marks	BTL
1.a)	Write an iteration formula to evaluate $\frac{1}{N}$ using Newton Raphson's method.	1	2
1.b)	Find Δe^x with $h=1$.	1	2
1.c)	What is numerical integration?	1	1
1.d)	Write the formula for Taylor series method to solve first order first degree differential equation.	1	1
1.e)	State Dirichlet conditions for Fourier series.	1	1
1.f)	State the Fourier integral theorem.	1	1
1.g)	Find whether the function $w=e^z$ is analytic or not.	1	1
1.h)	Define harmonic function.	1	1
1.i)	State Cauchy's generalized integral formula.	1	1
1.j)	Expand $f(z)=\sin z$ in Taylor series about $z=0$.	1	3

PART-B		(50Marks)	
Q.No.	Questions	Marks	BTL
2.	Compute a positive real root of the equation $xe^x = 2$, correct to four decimal places using Regula falsi method, (0,1).	10M	3

OR

3. Using Lagrange's interpolation formula, fit a polynomial to the data, also find the value of y when x=2. 10M 3

x	0	1	3	4
y	-12	0	6	12

4. 10M 6

x	0	0.25	0.50	0.75	1.00
y	1	0.9896	0.9589	0.9089	0.8415

Estimate the volume of the solid formed using Simpson's 1/3 rd rule. If V is the volume of the solid given by

$$V =$$

OR

5. Evaluate $y(0.2)$ of the differential equation $\frac{dy}{dx} = x - y$ given that $y(0)=1, h=0.1$ using R-K method of fourth order. **10M 5**

6. Find the half – range Sine series for $f(x) = x (\Pi - x)$ in $0 < x < \Pi$ and hence deduce that $\frac{1}{1^3} - \frac{1}{3^3} + \frac{1}{5^3} - \frac{1}{7^3} + \dots = \frac{\Pi^3}{32}$. **10M 3**

OR

7. Find the Fourier Sine and Cosine transform of the function $f(x) = \begin{cases} 0 & x < 1; \\ x & 0 < x < 1 \\ 0 & x > 1. \end{cases}$ **10M 3**

8. a) Show that the function $u = x^2 - y^2 - y$ is harmonic. Find conjugate harmonic function v of u . **5M 2**
b) Find real and imaginary parts of $\cos z$. **5M 1**

OR

9. Find the analytic function $f(z) = u + iv$, if $u - v = e^x (\cos y - \sin y)$. **10M 2**

10. Evaluate $\int_c \left(\frac{e^z}{z^3} + \frac{z^4}{(z+i)^2} \right) dz$ where $c: |z| = 2$ using Cauchy's integral formula. **10M 5**

OR

11. Find Laurent's series expansion for $f(z) = \frac{1}{z^2 - 5z + 6}$ in the region i) $2 < |z| < 3$ ii) $|z| > 3$. **10M 3**

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