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KAMALA INSTITUTE OF TECHNOLOGY & SCIENCE, SINGAPUR
23MA28BS301

II.B. Tech. I. Semester Supplementary Examinations, June- 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 the Newton-Raphson iteration formula	1	2											
1.b)	Write the Gauss's Backward interpolation formula	1	2											
1.c)	Write the formulae of Simpson's $\frac{1}{3}$ rd rule.	1	1											
1.d)	What is the iterative formula of Euler's method for solving $\frac{dy}{dx} = f(x,y)$ with $y(x_0)=y_0$	1	3											
1.e)	What is the Fourier Sine Transform of $f(x)$	1	1											
1.f)	Write the Fourier Series for an Odd function $f(x)$	1	2											
1.g)	Define Harmonic function	1	2											
1.h)	What are the sufficient conditions for the function $f(z)$ is to be analytic function	1	1											
1.i)	State Cauchy's Integral theorem.	1	3											
1.j)	Find the singular points of $f(z) = \frac{z^2}{(z+1)(z^2+1)}$	1	3											
PART-B			(50Marks)											
Q.No	Questions	Marks	BTL											
2.	Find real root of the equation $3x = e^x$ by bisection method.	10M	3											
OR														
3. a)	Find the interpolating polynomial $f(x)$ from the table <table border="1" data-bbox="378 1612 1133 1692"> <tr> <td align="center">x</td><td align="center">0</td><td align="center">1</td><td align="center">4</td><td align="center">5</td></tr> <tr> <td align="center">f(x)</td><td align="center">4</td><td align="center">3</td><td align="center">24</td><td align="center">39</td></tr> </table>	x	0	1	4	5	f(x)	4	3	24	39	5M	3	
x	0	1	4	5										
f(x)	4	3	24	39										
b)	Find $y(1.6)$ using Newton's Forward difference formula from the table <table border="1" data-bbox="310 1829 1206 1908"> <tr> <td align="center">x</td><td align="center">1</td><td align="center">1.4</td><td align="center">1.8</td><td align="center">2.2</td></tr> <tr> <td align="center">y</td><td align="center">3.49</td><td align="center">4.82</td><td align="center">5.96</td><td align="center">6.5</td></tr> </table>	x	1	1.4	1.8	2.2	y	3.49	4.82	5.96	6.5	5M	4	
x	1	1.4	1.8	2.2										
y	3.49	4.82	5.96	6.5										

4.	Evaluate the integral $\int_0^1 \frac{1}{1+x} dx$ (i) By Trapezoidal rule (ii) By Simpson's $\frac{3}{8}$ rule	10M	3
OR			
5.	Find $y(0.1)$ and $y(0.2)$ using Runge-Kutta 4 th order formula given that $\frac{dy}{dx} = x^2 - y$ and $y(0) = 1$	10M	4
6. a)	Find the Fourier series expansion of the function $f(x) = x, -\pi \leq x \leq \pi, f(x+2\pi)=f(x)$.	5M	3
b)	Write the Fourier cosine series for $f(x)=k, 0 \leq x \leq 5$	5M	3
OR			
7. a)	Find the Fourier transform of $f(x) = 1$ for $ x \leq 1$ and $= 0$ for $ x > 1$	5M	3
b)	Find the Fourier sine transform of $f(x) = x$ on $[0, \pi]$	5M	3
8.	Prove that the function $f(z)$ defined by $f(z) = \frac{x^3(1+i)-y^3(1-i)}{x^2+y^2}$ for $(z \neq 0), 0$ for $(z = 0)$ is continuous and the C-R equations are satisfied at $(0,0)$, yet $f'(0)$ does not exist.	10M	3
OR			
9.	Show that $u(x, y) = e^{2x}(x \cos 2y - y \sin 2y)$ is harmonic and find its harmonic conjugate and $f(z)$	10M	3
10.a)	Evaluate $\int_0^{1+i} (x^2 - iy) dz$ along the path $y = x^2$	5M	5
b)	Evaluate $\oint_c \frac{z^2+4}{z-3} dz$ where c is $ z =5$	5M	4
OR			
11.a)	Find the Laurent's expansion of $\frac{1}{z^2-4z+3}$ for $1 < z < 3$	5M	5
b)	Evaluate $\oint_c \frac{2e^z}{(z+1)^3} dz$ where c is the circle $ z-1 =3$ by using Cauchy's Residue theorem.	5M	4

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