Course Code: 23BS3T02

BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE

(AUTONOMOUS)

II-B. Tech I-Semester Supplementary Examinations (BR23), Mar – 2026

Numerical Methods & Complex Variables (EEE)

Time: 3 hours Max. Marks: 70

Question Paper consists of Part-A and Part-B

*Answer **ALL** the question in **Part-A and Part-B***

PART–A (10X2 = 20M)

		Marks	CO	BL
1. a)	Write the Regula-Falsi method formula.	(2M)	1	L2
b)	State Newton's Forward interpolation formula.	(2M)	1	L3
c)	Write Simpson's 1/3rd Rule.	(2M)	2	L2
d)	Write the Runge-Kutta second order formula.	(2M)	2	L2
e)	Find 'a' and ' b' if $f(z)=\left(x^2-2xy+ay^2\right)+i\left(bx^2-y^2+2xy\right)$ is analytic.	(2M)	3	L2
f)	Evaluate $\int_0^{2+i} z^2 dz$ along the real axis to y= 2 and then vertically to (2+i).	(2M)	3	L2
g)	Determine and classify the singular point of f(z) = $\sin\left(\frac{1}{z}\right)$	(2M)	4	L2
h)	Determine the residue of $\frac{ze^z}{(z-1)^2}$ at z=1.	(2M)	4	L3
i)	Whether the mapping $w=\cos z$ is conformal or not. Also find the critical points.	(2M)	5	L3
j)	Find the fixed points of $w=\frac{1+z}{1-z}$	(2M)	5	L2

PART–B (5X10 = 50M)

2a.	Find the root of the equation $x^3-4x-9=0$, using Bisection method. Correct to three decimal places.	5(M)	1 1	L2 L4
b.	Find the real root of the equation $x^3-x-1=0$ by the method of iteration.	5(M)		
	(OR)			
3a.	Using Lagrange's interpolation formula to find the value of y when x=10, if the following values of x and y are given	10(M)	1	L5

x	5	6	9	11
y	12	13	14	16

4 a.	Evaluate $\int_0^2 \frac{1}{1+x}dx$ by taking h = 0.1 by Trapezoidal rule.	6(M)	2	L2
b.	Evaluate $y(0.1)$ using Taylor's for $\frac{dy}{dx} = x^2 - y^2, y(0) = 1$	4(M)	2	L3
	(OR)			
5a.	Evaluate $y(0.1)$ using Picard's for $\frac{dy}{dx} = x + y, y(0) = 1.$	4(M)	2	L2
b.	Evaluate $y(0.1)$ using RK method of fourth order for $\frac{dy}{dx} = y - \frac{2x}{y}, y(0) = 1.$	6(M)	2	L3
6a.	If $f(z)$ is a regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)\lvert f(z)\rvert^2 = 4\lvert f^1(z)\rvert^2$	10(M)	3	L2
	(OR)			
7a.	Evaluate $\int_0^{2+i} \bar{z}dz$, along (i). The line $y = \frac{x}{2}$ (ii). The real axis to 2 and the vertically to 2+i.	4(M)	3	L3
			3	L2
b.	Evaluate $\oint_C \frac{z^2 - z + 1}{z-1}dz$ where C is the circle $\lvert z\rvert = 1 and \lvert z\rvert = \frac{1}{2}$.	6(M)		
8a.	Evaluate using Cauchy integral formula $\oint_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)}dz$ where C is the circle $\lvert z\rvert = 3$.	5(M)	4	L3
b.	Find Taylors expansion of $f(z) = \frac{2z^3 + 1}{z^2 + z}$ about the point z=i and z=1.	5(M)	4	L3
	(OR)			
9a.	Evaluate $\int_0^\infty \frac{dx}{(x^2 + a^2)^2}$	10(M)	4	L2
10a.	Discuss the transformation of $w = \frac{1}{z}$.	5(M)	5	L2
b.	Find the image of the circle $\lvert z\rvert = 2$ by the transformation $w = z + 3 + 2i.$	5(M)	5	L2
	(OR)			
11a.	Find the bilinear transformation which maps the points 0,2i, -2i to -1,0,∞ respectively.	10(M)	5	L1

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