RAMAIAH
Institute of Technology

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DEPARTMENT OF MATHEMATICS

Sub Code:	MAC21	Sub:	Numerical Techniques and Differential equations	Test:	I
Time:	09.30am to 10.30am	Term:	01-06-2023 TO 09-09-2023	Marks:	30
Date:	12-07-2023	Semester: II	Section:	CS/IS/AI&DS/AI&ML, CS(CS), CS(AI&ML), BT	

Note: Answer any TWO full questions. Each main question carries 15 marks.

Q.No.		Questions	Blooms Level	CO's	Marks
1.	(a)	Using Newton-Raphson method, find a root of $3x - \cos x - 1 = 0$ By taking initial guess as $x_0 = 0.6$.(Carryout 1 iteration).	L1	CO1	2
	(b)	Expand $f(x,y) = e^{2x-y}$ in a Taylor series about the point $(0,1)$ up to second degree terms.	L2	CO1	3
	(c)	Find the orthogonal trajectories of the family of curves $x^2 + y^2 + 2\lambda x = 0$ where λ is a parameter.	L3	CO2	5
	(d)	Find the minimum value of $x^2 + y^2 + z^2$, given that $xyz = a^3$.	L4	CO1	5
2.	(a)	Write the DE of the closed circuit involving L, C and R in series with applied e.m.f.	L1	CO2	2
	(b)	Using Euler's method, solve $\frac{dy}{dx} = 3x^2 + 1, y(1) = 2$ by taking $h = 0.5, x = 2$	L2	CO2	3
	(c)	Solve the system of non-linear equations $\sin xy + x - y = 0$; $y \cos xy + 1 = 0$ using Newton-Raphson method with $(1,2)$ as initial approximation. (Carryout 1 iteration).	L4	CO1	5
	(d)	Using R-K method of 4th order, solve $\frac{dy}{dx} = 3x + \frac{y}{2}, y(0) = 1$ at $y(0.1)$ by taking $h = 0.1$.	L3	CO2	5
3.	(a)	Verify that the point $(-7,-7)$ is maxima or minima for the function $f(x,y) = x^3 + y^3 - 63(x+y) + 12xy$.	L1	CO2	2
	(b)	If the temperature of the air is maintained at 150^0c and the temperature of the body cools from 70^0c to 40^0c in 10 minutes then find when the temperature of the body after 30 minutes.	L2	CO2	3
	(c)	Using Modified Euler's method, solve $\frac{dy}{dx} = x + \sin y, y(0) = 1$ at $y(0.2)$ by taking $h = 0.2$.	L3	CO1	5
	(d)	Expand $x^2 \sin^2 x$ in powers of x up to x^4 .	L5	CO1	5