Reg.No. | | | | | | | | |

DEPARTMENT OF SCIENCES, II SEMESTER M.Sc. (Physics)
END SEMESTER EXAMINATIONS, MAY/JUNE 2023
NUMERICAL METHODS AND COMPUTATIONAL PHYSICS [PHY5252]

(CHOICE BASED CREDIT SYSTEM - 2020)
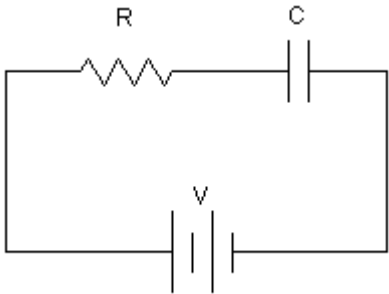
Time: 3 Hours   Date: 24-05-2023   MAX. MARKS: 50

Note   (i) Answer ALL questions

(ii) Draw diagrams, and write equations wherever necessary

		Marks	CO	BL
1A	State and prove the condition for convergence of the series of approximations to a root in iteration method.	5	2	3

1B	Give output of following C programs.
	
	(i) `#include<stdio.h>`
	`  main()`
	`  {`
	`    int i,j=0,sum=0;`
	`    for(i=1;i<=5;i++)`
	`    sum+=++j*j--;`
	`    printf("%d",sum);`
	`  }`
	
	(ii) `#include<stdio.h>`
	`  main()`
	`  {`
	`    int i=5,j=10;`
	`    float q1,q2;`
	`    q1=(float)i/j;`
	`    q2=i/j;`
	`    printf("%.3f\t%.3f",q1,q2);`
	`  }`
		3	1	4

1C	Convert the following equations into corresponding C statement. (i) $A = \dfrac{kl}{b\cos(x)}$ (ii) $c = \dfrac{a(b+3)}{a-ab}$	2	1	3
2A	Solve the following system of equations by LU decomposition method. $5x - 2y + z = 4$ $7x + y - 5z = 8$ $3x + 7y + 4z = 10$	5	2	3
2B	Given $y'' + y + 1 = 0$ with the boundary conditions $y = 0$ at $x = 0$ and $x = 1$. Find y at $x = 0.75$ by taking $h = 0.25$.	3	3	3

2C	Get first order ordinary differential equation for charge on the capacitor in the following circuit and give equations to solve it by Euler's method. 	2	3	3
3A	By assuming Newton's forward difference formula, derive general integration formula and hence obtain trapezoidal rule.	5	2	2
3B	Derive standard five-point formula to solve Laplace equation and explain Gauss-Seidel iterative method.	3	3	2
3C	Derive finite difference approximation for first and second order derivatives of y.	2	3	2
4A	The distance covered by a particle at different time instants is given below. Find the velocity of the particle at t = 6s. 	t (s)	2	3	5	6
d (m)	1.41	1.73	2.23	2.45		5	3	3
4B	Explain (i) if – else and (ii) for statements with syntax and suitable examples.	3	1	2
4C	Get second order Runge – Kutta formula for solving y' = f(x,y)	2	3	2
5A	If Y= a_0+a_1x is the straight line to be fitted to given set of data points (x_i, y_i) where i=0,1,2, …… m, then get the expressions for fitting parameters a_0 and a_1.	5	2	2
5B	How to simulate radioactive decay by Monte Carlo method? Explain by considering hypothetical decay A → B.	3	4	3
5C	What is a pseudo random number? Explain rand() and srand() functions in C	2	4	2

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