

BACHELOR OF CIVIL ENGINEERING EXAMINATION, 2023
(1st Year, 2nd Semester)

COMPUTER PROGRAMMING AND NUMERICAL METHODS

Time : Three hours

Full Marks : 100

(50 marks for each Part)

Use a separate Answer-Script for each part
PART – I

1. Write algorithm of following methods: **CO6**a. *Newton Raphson method.*

b. Lagrange interpolation method

5x2=10

2. Using *Runge Kutta Method of order 4*, find $y(0.4)$ given that $dy/dx = (2x^2+y)$, $y(0) = 1.5$. Take $h=0.2$. **CO4****OR**Derive the difference form of first and second derivative of y w.r.t x when y is known at 3 points (x_{i-1}, y_{i-1}) , (x_i, y_i) , (x_{i+1}, y_{i+1}) . **CO4**

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Answer any THREE from the questions below. (CO5)3. Fit a curve of the type $y=ae^{bx}$ for the following data set. Use *Least Square Method*.

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X	0.25	0.50	0.75	1.00	1.25	1.50
Y	3.10	1.70	1.00	0.68	0.42	0.26

4. Calculate $y(1.12)$ from the following data using *Newton Forward interpolation formula*:

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X	1.00	1.05	1.10	1.15	1.20	1.25	1.30
Y	1.0000	1.0247	1.0488	1.0724	1.0954	1.1180	1.1402

5. Find the dominant eigen-value and corresponding eigen-vector of [P] using Power method with initial approximation $[1 \ 1 \ 1]^T$. Perform maximum **SIX** iterations.

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$$[P] = \begin{bmatrix} 3 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 3 \end{bmatrix}$$

6. The velocities of a particle moving in a straight line at intervals of 2min are given below. Find the distance covered by the particle using *Trapezoidal rule and Simpson's 1/3rd rule*. Find percentage difference between the results.

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Time (min)	0	2	4	6	8	10	12
Velocity (km/hr)	0	22	30	27	18	7	0

[Turn over

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PART II (50 marks)

Instructions:	
I	All notations represent their standard relevant meaning.
II	If you feel that any data or condition is/are missing in any question, please assume relevant inputs and mention the same.
III	Make sure in the examples, input outputs, statements mentioned by you, none of your personal information like Name, Class roll no, registration number etc. are mentioned or indicated.
IV	Use separate answer scripts for each part

Sl No	Question	Marks	CO
1	Write a FORTRAN program that displays volume of a classroom having constant height throughout and a rectangular cross sectional area for user inputs to be taken for the basic necessary parameters. Show suitable input output statements.	6	CO2
2	Write a FORTRAN program that can generate a Matrix having 3 rows and 3 columns that will store 9 inputs to be given by the user for some real number to be considered as length inputs in meter and will give output of same dimension matrix as millimetre. Show relevant input output statements.	12	CO1
3	Explain 'arithmetic if' statement flowchart to discuss the logic of 'arithmetic if' statement and write any FORTRAN program using 'arithmetic if' as example with relevant input output statements.	10	CO1
4	Write a FORTRAN program that can display square of a number after it reads the number from an existing text file named as input.prob4.txt which is kept in an existing folder of the used computer with the given path: D: Fortran inputs>New Folder>My Inputs Show relevant input output statements.	12	CO2
5	Write a FORTRAN program using sub-program that will display summation of integers from 0 (zero) to 'n' where 'n' will be user input. Show suitable input output statements.	10	CO6