

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End-Term Examination, December 2023
 B. Tech. and BCA, Odd Semester, 2023-24

Roll No.....

AS2202: Numerical and Scientific Computing

Time: 2 hours

Max. Marks: 30

Instructions to students:

1. Do not write anything other than your roll number on the question paper.
2. You may use the non-programmable scientific calculator.
3. Specify, if you find any ambiguity in the questions. Justify and solve the question after removing that ambiguity.
4. Answer correctly to four decimal places in case of no specific mention of the requirement.
5. Mention the formula for each method, that you are using to solve the problem.

Q.1. Find the missing value in the following table.

x	0	5	10	15
f(x)	3	6	?	99

4.0
(CO2)

Q.2. The following data defines the sea-level concentration of dissolved oxygen for freshwater as a function of temperature.

T°C	0	8	16	24	32	40
O, mg/L	14.621	11.843	9.870	8.418	7.305	6.413

7.0
(CO1,2,3)

Estimate $O(27)$ using a suitable interpolation method and find the percentage error in the calculated value, if the exact value of $O(27)$ is 7.986 mg/L . Also, find the value of $O'(8)$.

Q.3. Compute the value of $I = \int_3^6 \frac{1}{x} dx$ using Simpson's 3/8 rule by dividing the interval into at least six subintervals, correct to two decimal places.

5.0
(CO2)

Q.4. Given the initial value problem defined by

$$\frac{dy}{dx} = y(1 + x^2), \quad y(0) = 1$$

7.0
(CO2)

Find the values of y for $x = 0.1$ using the Euler, the modified Euler, and the fourth order Runge-Kutta methods. Find the differences in the results from these methods.

Q.5. Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ for the temperature of the heated plate for the square region shown in the figure below using the finite difference method. Further, perform one iteration using the Gauss-Seidel method to compute, correct to two decimal places, the value of u at the internal mesh points. Find, how much the solution is improved after this iteration.

7.0
(CO1,2,3)

