

JK Lakshmipat University, Jaipur
Institute of Engineering and Technology
 End Term Examination, April 2024
 BCA (Backlog), Semester II, 2023-24

Roll No.....

AS1105: Computational Mathematics

Time: 2.5 hours

Max. Marks: 40

Instructions to students:

1. Do not write anything other than your roll number on the question paper.
2. Mention all the assumptions for your answers clearly.
3. Scientific calculator is allowed.

Q. 1	What is wrong with this famous supposed “proof” that $1 = 2$? Explain. Step 1. $a = b$ Step 2. $a^2 = ab$ Step 3. $a^2 - b^2 = ab - b^2$ Step 4. $(a + b)(a - b) = b(a - b)$ Step 5. $a + b = b$ Step 6. $2b = b$ Step 7. $2 = 1$	1.0 (CO 5)										
Q. 2	State the converse, contrapositive, and inverse of the conditional statement. “If it snows tonight, then I will stay at home.”	3.0 (CO 5)										
Q. 3	Let p, q and r be the propositions. p : Food is good. q : Service is good. r : Restaurant is 5-star. Write these propositions using p, q, r and logical connectives (including negations). a. Either food is good or service is good but not both. b. Food is good while the service is not good. c. If both food and service are good, then the rating will be 5-star. d. It is not true that 5-star rating always means good food and good service.	4.0 (CO 5)										
Q. 4	If $A = \begin{bmatrix} 1 & 3 \\ -1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$, and $C = \begin{bmatrix} -1 & 0 \\ 1 & 3 \end{bmatrix}$, show that the matrix multiplication is associative, that is, $(AB)C = A(BC)$.	4.0 (CO 1)										
Q. 5	Construct a 3×3 matrix $A = [a_{ij}]$, whose elements are given by $a_{ij} = \frac{i+2j}{2}$. Further, find $A - A^T$ and $A + A^T$. Is $A + A^T$ symmetric?	4.0 (CO 1)										
Q. 6	Perform Gauss elimination on the matrix $\begin{bmatrix} 2 & 1 & -1 \\ 1 & -0.5 & -1 \\ 2 & 4 & 1 \end{bmatrix}$.	3.0 (CO 1,2)										
Q. 7	A body travelling along a straight road was observed at various locations at different times: <table><tr><td>$t(s)$</td><td>1.0</td><td>2.0</td><td>3.0</td><td>4.0</td></tr><tr><td>$x(m)$</td><td>4.5</td><td>23.0</td><td>80.5</td><td>213.0</td></tr></table> Find Newton’s divided difference interpolating polynomial for the following data and hence, estimate the location of body at $t = 2.5$ s.	$t(s)$	1.0	2.0	3.0	4.0	$x(m)$	4.5	23.0	80.5	213.0	4.0 (CO 4,6)
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Q. 8	Use Runge-Kutta method of fourth order to find $y(0.8)$, given $y' = \sqrt{x+y}, \quad y(0.4) = 0.41.$ Perform two iterations, take the step length $h = 0.2$.	4.0 (CO 4)
Q. 9	Solve the following system of linear equations. $x_1 + 2x_2 - 6x_3 = 9$ $x_1 - 4x_2 + 4x_3 = -7$ $3x_1 + 8x_2 - 2x_3 = 13.$	4.0 (CO 1)
Q. 10	Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ using Simpson's 1/3 rule. Divide the interval (0,6) into six equal parts.	4.0 (CO 6)
Q. 11	Find the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} 4 & 1 \\ 1 & 4 \end{bmatrix}$. Further, verify Cayley-Hamilton theorem for the matrix A .	5.0 (CO 1)

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