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D1BCA2502

Name: .....

Reg. No.: .....

FIRST SEMESTER FYUGP EXAMINATION NOVEMBER 2025

(Regular/Improvement/Supplementary)

BCA

MAJOR

BCA1CJ 102: MATHEMATICAL FOUNDATION FOR COMPUTER APPLICATIONS

Time: 2 Hrs. **Maximum Marks: 70**

M: Mark BL: Bloom's Taxonomy Level (1 to 6) CO: Course Outcome

Section A

Ceiling Marks : 24

Answer all questions. Each carries 3 marks.

No.	Question	M	BL	CO
1.	Consider two matrices, $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 1 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 6 & 7 \end{bmatrix}$. Analyze their orders and determine if they can be added or multiplied.	3	3	CO1
2.	A student claims that the matrix $A = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ is an identity matrix. Evaluate this claim and provide a reason for your conclusion.	3	5	CO1
3.	For the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$, find the minor and cofactor of the element at position second row and third column.	3	6	CO1
4.	Find the value of x and y if $\vec{a} = x\hat{i} + 2\hat{j} + z\hat{k}$ and $\vec{b} = 2\hat{i} + y\hat{j} + \hat{k}$ are equal.	3	4	CO4
5.	If $\vec{c} = 3\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{d} = \hat{i} - 4\hat{j} - 3\hat{k}$ are two vectors. Evaluate the following. i. $\vec{a} + \vec{b}$ ii. $\vec{a} - \vec{b}$ iii. $\vec{a} \cdot \vec{b}$	3	5	CO4
6.	State First Principle of Differentiation.	3	1	CO5
7.	Find the derivative of $99x$ at x $= 100$ using $f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$.	3	5	CO5
8.	Is it possible to integrate $\sin x \sin(\cos x)$. If yes integrate the function otherwise state the reason.	3	6	CO5
9.	Find the integral $\int_{-1}^{1} t^3(1 + t^4)dt$.	3	2	CO5
10.	Prove that $\int_1^e \frac{lnx}{x} = \frac{1}{2}(lne)^2$ using the fundamental theorem of calculus.	3	5	CO5

Section B

Ceiling Marks : 36

Answer all questions. Each carries 6 marks.

No.	Question	M	BL	CO
11.	Given two matrices $A = \begin{bmatrix} 1 & 0 & -1 \\ -2 & 0 & 3 \\ 2 & 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 0 \\ 1 & 1 & 1 \\ -1 & -1 & 0 \end{bmatrix}$. Find AB and verify that $AI = IA = A$, where I is the identity matrix.	6	4	CO1

12.	Consider the matrix $\begin{bmatrix} 2 & -3 & 1 \\ 3 & 1 & 3 \\ -5 & 2 & -4 \end{bmatrix}$ Determine the eigenvalues of matrix using the characteristic equation.	6	2	CO2
13.	Solve the following system of linear equations using Gauss Elimination method. $2x + y - z = 3$ $4x - 6y = -2$ $-2x + 7y + 2z = 9$	6	5	CO2
14.	Given three vectors $\vec{a} = 4\hat{\imath} + 3\hat{\jmath} - 2\hat{k}, \vec{b} = -\hat{\imath} + 2\hat{\jmath} + \hat{k}, \vec{c} = \hat{\imath} - 3\hat{\jmath} + 4\hat{k}$ i. Find $\vec{r} = \vec{a} + \vec{b} + \vec{c}$ ii. Find $\lvert r \rvert$. iii. Determine $\vec{r}$ is a unit vector or not.	6	4	CO4
15.	Find the derivative of $(x - 1)(x - 2)$ using first principle of differentiation.	6	2	CO5
16.	Find the derivative of the function $f(x) = \log(\cos(x^2))$.	6	3	CO5
17.	Differentiate $x^{\sin x}$, $x > 0$ with respect to x.	6	5	CO5
18.	Let $F(x) = \int_0^x \frac{t^2}{1+t^3}\, dt$. Use the Fundamental theorem of Calculus to find $F'(x)$ and then evaluate the integral F(2) - F(l).	6	4	CO5

Section C

Answer any one question. Each carries 10 marks. (1 x 10 = 10 marks)

No.	Question	M	BL	CO
19.	a. Find the rank of the matrix $\begin{bmatrix} 1 & 4 \\ -2 & 3 \end{bmatrix}$. b. Find the inverse of the matrix $\begin{bmatrix} 4 & 7 & 1 \\ 7 & -1 & 2 \\ 3 & 0 & 3 \end{bmatrix}$.	10	3	CO1 CO2
20.	a. Find the integral $\int \frac{x}{e^{x^2}} dx$. b. Evaluate the integral of the function $(x^3 - 1)^{\frac{1}{3}} x^5$.	10	2	CO5