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Supplementary Examination-2023
For Odd Semester Examination-2022

Paper Name: Mathematical Foundation of Computer Science
Total Marks: 60

Paper Code: BCA/B.Sc.-103
Total Time: $2\frac{1}{2}$ hrs.

Attempt all questions from section A, any Four questions from section B and any Two questions from section C.

[SECTION-A]

All questions are compulsory. True or False & Fill in the blanks.

[20 Marks]

Q. No.	Questions	Marks	CO	BL
1.	True/False; In a square matrix if the elements are in consecutive form, then the value of its determinant is zero.	1	CO1	L1
2.	True/False; Every square matrix can be expressed as the sum of symmetric and skew symmetric matrix.	1	CO1	L2
3.	True/False; Eigen value of matrix A is not equal to the eigen value of A^T .	1	CO1	L3
4.	True/False; If $a_{ij} = a_{ji}, \forall i, j$, Then the matrix is Symmetric matrix.	1	CO1	L4
5.	True/False; The eccentricity(e) of the parabola is less than 1.	1	CO3	L1
6.	True/False; The second derivative corresponds to the Curvature or Concavity of the graphs.	1	CO4	L2
7.	True/False; Vector product of two vectors is not commutative,	1	CO2	L1
8.	True/False; Every differentiable function is continuous, but the converse is not true.	1	CO4	L2
9.	True/False; If the system of equations is Homogeneous, then $A.X = B$.	1	CO1	L1
10.	True/False; If $\nabla \times \vec{V} = \vec{0}$, then $\vec{V}$ is said to be an irrotational.	1	CO2	L2
11.	If $A\hat{A} = \hat{A}A = I$, then the matrix is.....	1	CO1	L1
12.	If $Z = f(x, y)$ is a homogeneous function of degree n , then Euler's Theorem states that.....	1	CO4	L2
13.	Matrices A and B will be inverse of each other only if $AB = BA = \dots\dots\dots$	1	CO1	L1
14.	$x^2 + y^2 + 2gx + 2fy + c = 0$, is an equation of..... with center	1	CO3	L2
15.	The fixed point on the Ellipse is called the	1	CO3	L1
16.	If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ then A^2 is ?	1	CO1	L5
17.	If $A = \begin{bmatrix} 2 & 3 \\ 8 & 9 \end{bmatrix}$, then find the rank of A^T .	1	CO1	L4
18.	If $Z = 4x^3y^4$. Find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$.	1	CO4	L5
19.	Find $\frac{dy}{dx}$ of $x^2 + y^2 = a$.	1	CO4	L4
20.	If $A = \begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$ then find A^T .	1	CO1	L5

[SECTION-B]

Attempt any Four questions. $4 \times 05 = 20$ Marks

Q. No.	Questions	Marks	CO	BL
1.	If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$, then show that $A^3 - 6A^2 + 7A + 2I = O$, where I is the identity matrix of order 3 and O is the null matrix of order 3.	5	CO1	L5
2.	Calculate the modulus and unit vector along the sum of the vectors: $3\hat{i} + \hat{j} + 5\hat{k}$, $2\hat{i} - \hat{j} + 6\hat{k}$, $5\hat{i} + 2\hat{j} - 3\hat{k}$.	5	CO2	L4
3.	Find the Rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 3 & 4 & 5 & 6 \\ 3 & 4 & 5 & 6 & 7 \\ 4 & 5 & 6 & 7 & 8 \end{bmatrix}$ by Rank method.	5	CO1	L3
4.	If $Z = (1 - 2xy + y^2)^{-1/2}$, Prove that $xf_x - yf_y = y^2z^3$.	5	CO4	L2
5.	Using Cayley-Hamilton theorem, find A^8 , if $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$.	5	CO1	L6
6.	Differentiate the function w.r.t. x . $x^3 + y^3 - 3axy = 0$.	5	CO4	L1

SECTION-C

Attempt any Two questions. $2 \times 10 = 20$ Marks

Q. No.	Questions	Marks	CO	BL
1.	(a): Find the Latent roots of the matrix, $A = \begin{bmatrix} 1 & 2 & 1 \\ 6 & -1 & 0 \\ -1 & -2 & -1 \end{bmatrix}$. (b): Verify Cayley-Hamilton theorem and find the inverse of matrix $A = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$.	5 5	 CO1	L4 L5
2.	Find the values of a, b, c for which the vector $\vec{V} = (x + y + az)\hat{i} + (bx + 3y - z)\hat{j} + (3x + cy + z)\hat{k}$ is irrotational.	10	CO2	L6
3.	Find the characteristic equation of the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ and hence, compute A^{-1} . Also find the matrix represented by $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$.	10	CO1	L4
4.	Find the asymptotes of the curve $y^3 - 5xy^2 + 8x^2y - 4x^3 + 9xy - 3y^2 - 6x^2 + 2y - 2x - 1 = 0$.	10	CO1	L2

BL-Bloom's Taxonomy Levels: (1-Remembering, 2-Understanding, 3-Applying, 4-Analysing, 5-Evaluating, 6-Creating)