Enroll No…………….. **Roll No…………………**

No. of Pages: 03

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Examination: Odd Semester Examination 2020

Paper Name: Mathematical Foundation of Computer Science
Paper Code: BCA/BCIA-103
Time: 3 Hours **Maximum Marks: 75**
Note: Mobile Phones or programmable calculator or any equipment with memory are not allowed inside the examination hall. Follow proper numbering for answering the questions.

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

Section- A [From Question 1 to 19 (01 Marks), From Question 20 to 27 (02 Marks)]

Question 1. State whether True/False; A matrix having only one row is called column-vector.

Question 2. State whether True/False; A matrix having only one column is called column-vector.

Question 3. State whether True/False;$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ is an scalar matrix.

Question 4. State whether True/False; if $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 0 & 5 & 6 \end{bmatrix}$, then rank of the matrix A,.

$\rho(A) = 4$.

Question 5. State whether True/False; sum of diagonal elements of a square matrix is equal to sum of its Eigen values.

Question 6. State whether True/False; Vector product of two vectors is commutative,

Question 7. State whether True/False; If curl $\vec{V} \neq 0$, then $\vec{V}$ is said to an irrotational.

Question 8. Matrix multiplication is not……….. in general.

Question 9. In Matrix multiplication the distributive property $(A + B)C = \ldots\ldots$

Question 10. If $A\acute{A} = \acute{A}A = I$ then the matrix is…………………

Question 11. If A & B are two square matrices of same kind then $(AB)' =$……………

Question 12. If $a_{ij} = -a_{ji,} \forall\ i, j$. Then the matrix is…………..

Question 13. Every square matrix satisfies its own characteristic equation. This theorem is known as…………

Question 14. If $Z = f(x, y)$ is a homogeneous function of degree n, then Euler's theorem States that……

Question 15. If $\vec{a}$ & $\vec{b}$ are two non-zero vectors, then $\vec{a}.\vec{b} = 0$ if and only if $\vec{a}$ & $\vec{b}$ are……to each other.

Question 16. If $\vec{a}$ & $\vec{b}$ are two non-zero vectors, then $\vec{a} \times \vec{b} = 0$ if and only if $\vec{a}$ & $\vec{b}$ are……to each other.

Question 17. If ∇ is a vector differential operator then gradφ =..........

Question 18. If vector $\vec{V}$ is Non-solenoidal, then $\nabla.\vec{V}$ =............

Question 19. If $z = x^2y$, then $\frac{\partial^2 z}{\partial x \partial y}$ =..........

Question 20. If $A = \begin{bmatrix} 2 & -1 \\ 3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 4 \\ 7 & 2 \end{bmatrix}$, then find $3A - 2B$.

Question 21. If $A = diag(1 - 1\ \ 2)\ and\ B = diag(2\ \ 3\ - 1)$, find the value of $A + B$, $and\ 3A + 4B$.

Question 22. If $A = \begin{bmatrix} 6 & 8 \\ 2 & 4 \end{bmatrix}$, then find A^{-1}.

Question 23. If $A = \begin{bmatrix} 5 & 3 \\ 6 & 4 \end{bmatrix}$, find $\frac{A^{-1} + A'}{2}$.

Question 24. If $A = \begin{bmatrix} 7 & 3 \\ 6 & 4 \end{bmatrix}$, then find the rank of A^5.

Question 25. Find $\frac{d}{dx}(e^x logx)$.

Question 26. If $u = \log(x^2 + y^2 + z^2)$. Find $\frac{\partial u}{\partial x}$, $\frac{\partial u}{\partial y}$ and $\frac{\partial u}{\partial z}$.

Question 27. Given $z = x^3 + x^2y + y^3$, then find $x\frac{\partial z}{\partial x}$ and $y\frac{\partial z}{\partial y}$.

<u>Section-B (Each question carries 05 Marks)</u>

Question 1. If A=$\begin{bmatrix} 2 & 2 & 1 \\ -2 & 1 & 2 \\ 1 & -2 & 2 \end{bmatrix}$ and B=$\begin{bmatrix} 1 & 3 & 2 \\ 1 & 1 & 1 \\ 2 & -3 & -1 \end{bmatrix}$ be two square matrices of order 3,

find $A + B,\ A - B$ and check whether $AB = BA$ or not in this case.

Question 2. 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.

Question 3. Find the Latent roots of the matrix, A=$\begin{bmatrix} 1 & 2 & 1 \\ 6 & -1 & 0 \\ -1 & -2 & -1 \end{bmatrix}$.

Question 4. Let A, B, C, D be $n \times n$ matrices each with non-zero determinant. If ABCD = I, then find the value of B^{-1} , where I be an Identity Matrix.

Question 5. Find the value of x of the given matrix A=$\begin{bmatrix} 6 & 3 & 5 & 9 \\ 5 & 2 & 3 & 6 \\ 3 & 1 & 2 & 3 \\ 2 & 1 & 1 & x \end{bmatrix}$. If rank is 3.

Question 6. If $Z = (1 - 2xy + y^2)^{-1/2}$, Prove that $xf_x - yf_y = y^2z^3$.

Section- C (Each question carries 10 Marks)

Question 1. (a). Find $\frac{dy}{dx}$, when $x = 2cost - cos2t, and\ y = 2sint - sin2t$ at $t = \frac{\pi}{4}$.

(b). If $r^2 = x^2 + y^2 + z^2$, then prove that $\frac{\partial^2 r}{\partial x^2} + \frac{\partial^2 r}{\partial y^2} + \frac{\partial^2 r}{\partial z^2} = \frac{2}{r}$.

Question 2. (a). If $\vec{F} = (x + y + 1)\hat{\imath} + \hat{\jmath} - (x + y)\hat{k}$, show that $\vec{F}.Curl\ \vec{F} = 0$.

(b). Find the sine angle between the vectors $\hat{\imath} + 3\hat{\jmath} + 2\hat{k}\ and\ 2\hat{\imath} - 4\hat{\jmath} + \hat{k}$, provided that $|\hat{n}| = 1$.

Question 3. (a). If $y = sin2x\ sin3x,$ find the nth derivative of the function i.e., y_n.

(b). If $y = x^2e^x$ then find y_n by Leibnitz theorem.

Question 4. (a). Find the Asymptotes of the curve $x^2 + 3xy + 2y^2 + 3x - 2y + 1 = 0$.

(b). Solve the Linear differential Equation $\frac{dy}{dx} - \frac{y}{x} = 2x^2$. Find the value of C if $y = 0\ and\ x = 1$.

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