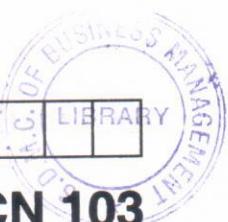


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BCACACN 103



First Semester B.C.A. Degree Examination, December 2023/January 2024
(NEP – 2020) (2021 – 22 Batch Onwards)
MATHEMATICAL FOUNDATION
(DSCC)

Time : 2 Hours

Max. Marks : 60

Note : Answer **any six** questions from Part – A and **one full question** from **each** Unit in Part – B.

PART – A

1. a) Find the distance between (5, 5) and (-3, 3). **(6x2=12)**
- b) Prove that $\log_y x \cdot \log_x y \cdot \log_z x = 1$.
- c) Represent 225° and 120° in radians.
- d) Find the limit of $\frac{4x^4 + 3x^2 - 1}{x^3 + 7}$ when $x = 1$.
- e) If matrix $X = \begin{bmatrix} 4 & -3 \\ 8 & -2 \\ -1 & 0 \end{bmatrix}$, find $4A$.
- f) Let matrix $A = \begin{bmatrix} 6 & 5 \\ 3 & 2 \end{bmatrix}$. Find $|A|$.
- g) Define characteristic equation of a matrix.
- h) Write the formula to calculate the n^{th} term and sum of n terms in A.P.

PART - B



Unit - I

2. a) Prove that $\log \frac{81}{8} - 2 \log \frac{3}{2} + 3 \log \frac{2}{3} + \log \frac{3}{4} = 0.$

b) Find the 5th term in the expansion of $\left(\frac{3x}{4} + \frac{4}{3x} \right)^{12}$.

c) Prove that the quadrilateral with vertices (6, 6), (2, 3) and (4, 7) are the vertices of a right angled triangle. (4+4+4)

3. a) Solve for x, if $\log_x 3 + \log_x 9 + \log_x 729 = 9.$

b) Find the area of the triangle represented by (2, 3), (5, 7) and (-3, 4).

c) Find the equation of straight line passing through the point (-3, 1)

perpendicular to the line $5x - 2y + 7 = 0.$ (4+4+4)

Unit - II

4. a) If $\cos \theta = \frac{24}{25}$ and θ is an acute angle, find the values of $\sin \theta, \operatorname{cosec} \theta, \tan \theta$

and $\cot \theta.$

b) Evaluate $\lim_{x \rightarrow 3} \frac{x^2 + 2x - 5}{x^2 - 9}.$

c) Differentiate $9x^4 - 7x^3 + 8x^2 - \frac{8}{x} + \frac{10}{x^3}$ with respect to x. (4+4+4)

5. a) If $\sin \theta = \frac{8}{17}$, find $\tan \theta + \sec \theta.$

b) Discuss the continuity of the function $f(x) = \frac{x^2 - 4}{x - 2}$ when $0 \leq x \leq 2,$

$f(x) = 2$, for $x \geq 2$, discuss the continuity at $x = 2.$

(4+4+4)

c) Evaluate $\int (4x^3 + 3x^2 - 2x + 5) dx.$

**Unit - III**

6. a) If $A = \begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$, $B = \begin{bmatrix} -1 & -2 & -1 \\ 6 & 12 & 6 \\ 5 & 10 & 5 \end{bmatrix}$ and $C = \begin{bmatrix} -1 & -1 & 1 \\ 2 & 2 & -2 \\ -3 & -3 & 3 \end{bmatrix}$, show that $A \cdot B$ and $C \cdot A$ are null matrices.

b) If $A = \begin{bmatrix} 2 & -3 & 1 \\ 4 & 2 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -2 & 4 \\ 1 & 3 & -5 \end{bmatrix}$, show that $(A + B)' = A' + B'$. (6+6)

7. a) If $A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix}$, show that $A^3 - 3A^2 - A + 9I = 0$.

b) If $A = \begin{bmatrix} 1 & 4 & 5 \\ 3 & 2 & 6 \\ 0 & 1 & -3 \end{bmatrix}$, find the Adjoint of A. (6+6)

Unit - IV

8. a) Find the inverse of $\begin{bmatrix} 1 & 0 & -4 \\ -2 & 2 & 5 \\ 3 & -1 & 2 \end{bmatrix}$.

b) Using matrices, solve the following equations :

$$x + y + 2z = 4$$

$$2x - y + 3z = 9$$

$$3x - y - z = 2$$

(6+6)

9. a) Show that the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 3 \\ 0 & 0 & 2 \end{bmatrix}$ satisfies its characteristic equation.

b) Find the three numbers in A.P. whose sum is 24 and whose product is 440.

(6+6)