

Reg. No.

--	--	--	--	--	--	--	--	--	--



BCACACN 103

**First Semester B.C.A. Degree Examination, February/March 2023
(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

(6×2=12)

1. a) Write the binomial theorem.
- b) Find the value of :
 - i) $\log_4 256$
 - ii) $\log_2 64$.
- c) Find the coordinates of the centroid of a triangle whose vertices are (3, -2), (-1, -4) and (-5, 6).
- d) Represent the angles 90° and 135° in radians.
- e) Differentiate $4x^3 - 7x^4$ with respect to x.
- f) Define diagonal matrix. Give an example.
- g) Find the first term and the common difference in an AP if n^{th} term is $7n - 3$.
- h) Define Echelon form of a matrix with an example.

PART – B

Unit – I

2. a) Prove that $\frac{\log \sqrt{27} + \log \sqrt{8} - \log \sqrt{125}}{\log 6 - \log 5} = \frac{3}{2}$.
- b) Find the 7th term in the expansion of $\left(x^3 - \frac{1}{x}\right)^9$.
- c) Find the equation of straight line passing through (2, 4) and perpendicular to $5x - 7y = 100$. **(4+4+4)**

P.T.O.



3. a) If $\log_2 x + \log_4 x + \log_{16} x = \frac{21}{4}$, find x .
- b) Show that the quadrilateral with points $(2, -1)$ $(3, 4)$ $(-2, 3)$ and $(-3, -2)$ is a rhombus.
- c) Find the centre and radius of the circle, whose equation is $x^2 + y^2 - 4x + 8y - 5 = 0$.

(4+4+4)

Unit - II

4. a) Find the value of $\frac{\tan 45^\circ}{\operatorname{cosec} 30^\circ} + \frac{\sec 60^\circ}{\cot 45^\circ} + \frac{5}{2} \cdot \frac{\sin 90^\circ}{\cos 0^\circ}$.

b) Evaluate $\lim_{x \rightarrow 2} \frac{2x^2 - 7x + 6}{5x^2 - 11x + 2}$.

c) Evaluate $\int \left(7x^2 - 3x + 8 - \frac{1}{\sqrt{x}} + \frac{1}{x} + \frac{1}{x^2} \right) dx$.

(4+4+4)

5. a) Consider $f(x) = \frac{x^2 - 4}{x - 2}$ for $x < 2$,

$f(x) = 4$ for $x = 2$,

$f(x) = 2$ for $x > 2$, explain the continuity at $x = 2$.

b) If θ is in fourth quadrant and $\cos \theta = \frac{5}{13}$, find value of $\frac{13 \sin \theta + 5 \sec \theta}{5 \tan \theta + 6 \operatorname{cosec} \theta}$.

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

(4+4+4)

Unit - III

6. a) If $A = \begin{pmatrix} 2 & 0 & 4 \\ 6 & 2 & 8 \\ 2 & 4 & 6 \end{pmatrix}$ $B = \begin{pmatrix} 10 & 0 & 4 \\ -2 & 15 & 7 \\ 2 & 2 & 2 \end{pmatrix}$ $C = \begin{pmatrix} 0 & 0 & 4 \\ -2 & 0 & 7 \\ 2 & 1 & 5 \end{pmatrix}$.

Find $3(A + B) - 2(C + A)$.

b) Find the adjoint of $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$.

(6+6)



7. a) If $A = \begin{pmatrix} 3 & -3 & 0 \\ 6 & 3 & 9 \\ 12 & 3 & 24 \end{pmatrix}$ $B = \begin{pmatrix} 2 & 3 & 0 \\ 6 & -9 & 3 \\ 3 & 3 & -3 \end{pmatrix}$. Find $(AB)' = B'A'$.

b) Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 5 \\ 2 & 4 & 8 \end{bmatrix}$.

c) If $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$, show that $A^2 = 2A$.

(6+3+3)

Unit – IV

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

b) Find the three numbers in an AP whose sum is 30 and product is 840. (6+6)

9. a) Using Cramer's rule, solve the equations $x + y + z = 11$, $2x - 6y - z = 0$ and $3x + 4y + 2z = 0$.

b) Three numbers whose sum is 18 are in AP and if 2, 4, 11 are added to them respectively, the resulting numbers are in GP. Determine the numbers. (6+6)