



# BRAINWARE UNIVERSITY

Term End Examination 2023-2024

Programme – BCA-Hons-2023

Course Name – Mathematics and Numerical Methods

Course Code - BCA10001

( Semester I )

Library  
Brainware University  
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Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

## Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

(i) Choose the correct option. A matrix  $A$  can be factorized into lower and upper triangular matrix if all the principal minors of  $A$  are

a) singular

b) non-singular

c) zero

d) none of these.

(ii) If  $A$  and  $B$  are square matrices and  $A^{-1}$ ,  $B^{-1}$  exist, then select the correct statement

a)  $(AB)^{-1} = AB$

b)  $(AB)^{-1} = A^{-1} B^{-1}$

c)  $(AB)^{-1} = B^{-1} A^{-1}$

d) None of these

(iii) Select the correct option. If a square matrix  $A$  of order 3 is multiplied by a scalar  $k$ , the determinant of the resulting matrix is evaluated by

a)  $k |A|$

b)  $|A|/k$

c)  $k^3 |A|$

d)  $|A|/k^3$

(iv) Choose the correct option. Calculate the value of  $\left(\frac{\Delta^2}{E}\right) x^2$  is, when  $h=1$

a)  $2x^2$

b)  $3x^2$

c)  $4x^2$

d)  $6x^2$

(v) If  $A$  is an invertible matrix select the right one

a)  $A^{-1} = \frac{1}{|A|} (\text{adj } A)$

b)  $A^{-1} = -A$

c)  $A^{-1} = 1/A$

d)  $A^{-1} = A$

(vi) Choose the correct option. In Gauss Jordan method to solve  $AX=B$ ,  $A$  is reframed as

a) singular matrix

b) non-singular matrix

c) diagonal matrix

d) orthogonal matrix

(vii)

Select the correct option.  $\frac{d}{dx} \left\{ \cos^{-1} \frac{x}{5} \right\}$

a)  $\frac{1}{\sqrt{25-x^2}}$

b)  $-\frac{1}{\sqrt{25-x^2}}$

c)  $\sqrt{25-x^2}$

d)  $\frac{1}{\sqrt{25+x^2}}$

(viii)

Choose the correct option. If  $\Delta$  and  $\nabla$  are the forward and backward difference operators respectively, then compute  $\Delta - \nabla$  is equal to

a)  $\Delta + \nabla$

b)  $\Delta \cdot \nabla$

c)  $-\Delta \cdot \nabla$

d)  $\frac{\Delta}{\nabla}$

(ix)

Select the correct option. If 'a' be the actual value and 'e' be its estimated value, then define formula for relative error.

a)  $\frac{a}{e}$

b)  $\frac{|a-e|}{e}$

c)  $\frac{(a-e)}{e}$

d)  $\frac{|a-e|}{a}$



2. If  $A = \begin{bmatrix} 1 & 3 \\ -1 & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 2 \\ 4 & -1 \end{bmatrix}$ . Identify the matrices  $2A-B$ . (3)

3. Write the following numbers into the round off number correct up to 4-significant digits: (3)
- 5.2056
  - 0.24062
  - 0.0055672
  - 87.268466

4. Illustrate  $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}$ , where  $\omega$  is cube root of unity. (3)

5. Illustrate the value of  $\frac{dy}{dx}$  if  $y = \sec 2x \tan 2x$ . (3)

6. Evaluate the forward difference table for the following data: (3)

$x$	0	1	2	3
$f(x)$	1	2	11	34

OR

Justify that  $\Delta = E - 1$ . (3)

### Group-C

(Long Answer Type Questions)

5 x 6=30

7. If  $A = \begin{bmatrix} 3 & 2 & 1 \\ 1 & 1 & 1 \\ 5 & 1 & -1 \end{bmatrix}$ , identify the minor and co-factor of 3, 2 and -1 (5)

8. If  $u = \frac{5xy^2}{z^2}$  then examine that the relative error at  $x = y = z = 1$  with  $\Delta x = \Delta y = \Delta z = 0.001$  in evaluating  $u$  is 0.006. (5)

9. State the values of  $x, y, z$  from the system of equations using Cramer's rule (5)

$$\begin{aligned} 3x + y + z &= 4 \\ x - y + 2z &= 6 \\ x + 2y - z &= -3 \end{aligned}$$

10. Distinguish the value of  $K$  for which the function is continuous at  $x=2$ .  $f(x) = \begin{cases} Kx^2 + 2x, & x < 2 \\ Kx^3, & x \geq 2 \end{cases}$  (5)

11. Estimate the root of  $\tan x + x = 0$  lies between 2 and 2.1, correct upto two decimal places by bisection method. (5)

12. Conclude that  $\Delta^2(x^2 + 2x + 5) = 2$ , taking  $h = 2$  (5)

OR

Evaluate the value of  $\left(\frac{D^2}{E}\right)x^3$  is, when  $h=1$ . (5)

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