

CUET UG (Applied Maths) - 03 June 2025 Shift 2

Common Maths

Question1

If $z = 3x + 4y$ be the objective function of a linear programming problem (LPP) and $(3, 1), (2, 4), (0, 4), (5, 0)$ be corner points of the bounded feasible region. Then the maximum value of objective function is

1. 13
2. 10
3. 22
4. 14

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: C

Solution:

The maximum value of the objective function is the maximum value it obtains at the corner points.

$$z = 3x + 4y$$

$$\text{At } (x, y) = (3, 1) : z = 3 \times 3 + 4 \times 1 = 9 + 4 = 13$$

$$\text{At } (x, y) = (2, 4) : z = 3 \times 2 + 4 \times 4 = 6 + 16 = 22$$

$$\text{At } (x, y) = (0, 4) : z = 3 \times 0 + 4 \times 4 = 0 + 16 = 16$$

$$\text{At } (x, y) = (5, 0) : z = 3 \times 5 + 4 \times 0 = 15 + 0 = 15$$

Therefore the maximum value of the objective function is 22

Correct Option: (3)

Question2

If A be a square matrix of order 3 such that $|A| = 2$, then $|\text{adj}(2A)|$ is equal to

1. 16
2. 32
3. 64
4. 256

Options:

- A.

B.

2

C.

3

D.

4

Answer: D

Solution:

We know that if the order of a square matrix A is n , then

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

and

$$|cA| = c^n |A|$$

Here, the order of matrix A is 3.

$$\therefore |\text{adj}(2A)| = |2A|^{3-1} = |2A|^2 = (2^3 |A|)^2 = (8|A|)^2 = 64|A|^2$$

If $|A| = 2$, then

$$|\text{adj}(2A)| = 64 \times 2^2 = 64 \times 4 = 256$$

Correct Option: (4)

Question3

Match List-I with List-II

List I	List II
(A) Degree of this differential equation $\frac{d^4 y}{dx^4} + 2 \log_e \left(\frac{d^3 y}{dx^3} \right) = 0$	(I) 1
(B) Order of this differential equation $e^{\left(\frac{dy}{dx}\right)^3} + 3y \left(\frac{d^2 y}{dx^2} \right)^3 = 0$	(II) 4
(C) Degree of $\frac{d^4 y}{dx^4} + \left(\frac{dy}{dx} \right)^2 = 0$	(III) not defined
(D) Order of the differential equation $2 \frac{d^4 y}{dx^4} + \left(\frac{d^2 y}{dx^2} \right)^5 = 0$	(IV) 2

Choose the correct answer from the options given below:

- (A) - (II), (B) - (IV), (C) - (III), (D) - (I)
- (A) - (III), (B) - (IV), (C) - (I), (D) - (II)
- (A) - (III), (B) - (IV), (C) - (II), (D) - (I)
- (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

Options:

A.

1

B.

2

C.

3

D.

4

Answer: B

Solution:

We know that the order of a differential equation is the order of the highest derivative present, and the degree of a differential equation (if defined) is the power of the highest order derivative after the equation is free from radicals and fractions.

$$(A) \frac{d^4 y}{dx^4} + 2 \log_e \left(\frac{d^3 y}{dx^3} \right) = 0$$

Since $\log_e \left(\frac{d^3 y}{dx^3} \right)$ involves a logarithm of a derivative,

the equation is not polynomial in its derivatives. Hence, the degree is not defined.

$$\Rightarrow (A) \rightarrow (III)$$

$$(B) e^{\left(\frac{dy}{dx}\right)^3} + 3y \left(\frac{d^2 y}{dx^2}\right)^3 = 0$$

The highest derivative is $\frac{d^2 y}{dx^2}$.

So the order is 2.

$$\Rightarrow (B) \rightarrow (IV)$$

$$(C) \frac{d^4 y}{dx^4} + \left(\frac{dy}{dx} \right)^2 = 0$$

The equation is polynomial and the highest order derivative is $\frac{d^4 y}{dx^4}$.

Degree is 1.

$$\Rightarrow (C) \rightarrow (I)$$

$$(D) 2 \frac{d^4 y}{dx^4} + \left(\frac{d^2 y}{dx^2} \right)^5 = 0$$

The highest order derivative is $\frac{d^4 y}{dx^4}$.

Order is 4.

$$\Rightarrow (D) \rightarrow (II)$$

Correct Option: (2)

Question4

If A and B are symmetric matrices, then $AB - BA$ is

1. Singular matrix
2. Zero matrix
3. Symmetric matrix
4. Skew symmetric matrix

Options:

A. 1

- B. 2
- C. 3
- D. 4

Answer: D

Solution:

We know that if A and B are symmetric matrices, then $A^T = A$ and $B^T = B$.

Consider the matrix $AB - BA$,

$$(AB - BA)^T = (AB)^T - (BA)^T = B^T A^T - A^T B^T = BA - AB = -(AB - BA)$$

Since the transpose of $(AB - BA)$ is the negative of itself, it is a skew-symmetric matrix.

Correct Option: (4)

Question5

If A is an invertible matrix, then which of the following statement(s) is/are TRUE?

- (A) $|A^{-1}| = |A|$
- (B) $(A^{-1})^{-1} = A$
- (C) $A^{-1} = \frac{\text{adj } A}{|A|}$
- (D) $(A^T)^{-1} = (A^{-1})^T$

Choose the **correct** answer from the options given below:

1. (A), (B) and (C) only
2. (B) and (C) only
3. (C) only
4. (B), (C) and (D) only

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: D

Solution:

We know that if A is invertible, then $A^{-1} = \frac{\text{adj } A}{|A|}$ and $|A^{-1}| = \frac{1}{|A|}$.

(A) $|A^{-1}| = |A|$ is false since $|A^{-1}| = \frac{1}{|A|}$.

(B) $(A^{-1})^{-1} = A$ is true.

(C) $A^{-1} = \frac{\text{adj } A}{|A|}$ is true.

(D) $(A^T)^{-1} = (A^{-1})^T$ is also true.

Correct Option: (4)

Question6

$\int_0^a \frac{\sqrt{x}}{\sqrt{x} + \sqrt{a-x}} dx$ is equal to

1. a

2. $\frac{a}{2}$

3. $\frac{a}{3}$

4. $2a$

Options:

A. 1

B. 2

C. 3

D. 4

Answer: B

Solution:

$$\text{Let } I = \int_0^a \frac{\sqrt{x}}{\sqrt{x} + \sqrt{a-x}} dx$$

$$\text{Using } \int_0^a f(x) dx = \int_0^a f(a-x) dx,$$

$$I = \int_0^a \frac{\sqrt{a-x}}{\sqrt{a-x} + \sqrt{x}} dx$$

$$2I = \int_0^a \left[\frac{\sqrt{x}}{\sqrt{x} + \sqrt{a-x}} + \frac{\sqrt{a-x}}{\sqrt{a-x} + \sqrt{x}} \right] dx$$

$$2I = \int_0^a 1 dx = a \Rightarrow I = \frac{a}{2}$$

Correct Option: (2)

Question7

Let X denotes the number of heads in a simultaneous toss of three coins, then $P(0 < X < 3)$ is

1. $\frac{1}{2}$

2. $\frac{3}{4}$

3. $\frac{7}{8}$

4. 1

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: B

Solution:

Possible outcomes: HHH, HHT, HTH, HTT, THH, THT, TTH, TTT.

$$P(X = 0) = \frac{1}{8}, P(X = 1) = \frac{3}{8}, P(X = 2) = \frac{3}{8}, P(X = 3) = \frac{1}{8}$$

$$P(0 < X < 3) = P(X = 1) + P(X = 2) = \frac{3}{8} + \frac{3}{8} = \frac{6}{8} = \frac{3}{4}$$

Correct Option: (2)

Question8

The area (in sq. units) of the region bounded by $y = -1$, $y = 2$, $x = y^3$ and $x = 0$ is equal to

- 1. 4
- 2. 8
- 3. $\frac{17}{4}$
- 4. $\frac{15}{4}$

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: C

Solution:

Bounded by $y = -1$, $y = 2$, $x = y^3$, $x = 0$.

$$A = \int_0^2 (y^3 - 0) dy + \int_{-1}^0 (0 - y^3) dy$$

$$\int y^3 dy = \frac{y^4}{4}$$

$$\int_0^2 y^3 dy = \frac{16}{4} - 0 = 4$$

$$\int_{-1}^0 (-y^3) dy = -\left(0 - \frac{1}{4}\right) = \frac{1}{4}$$

$$A = 4 + \frac{1}{4} = \frac{17}{4}$$

Correct Option: (3)

Question9

The general solution of the differential equation $\frac{dy}{dx} = -4xy^2$ is given by

1. $2x^2 - y = C$: C is an arbitrary constant
2. $2x^2 - \frac{1}{y} = C$: C is an arbitrary constant
3. $2x^2 + \frac{1}{y^2} = C$: C is an arbitrary constant
4. $2x^2 + \frac{1}{y} = C$: C is an arbitrary constant

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: B

Solution:

$$\frac{dy}{dx} = -4xy^2$$

$$\frac{dy}{y^2} = -4x \, dx$$

$$\int \frac{dy}{y^2} = \int -4x \, dx$$

$$-\frac{1}{y} = -2x^2 + C$$

$$\frac{1}{y} = 2x^2 - C$$

$$2x^2 - \frac{1}{y} = C$$

Correct Option: (2)

Question10

Assume A, B and C are matrices of order $m \times n$, $n \times 3$ and $3 \times q$ respectively. The restrictions on m, n and q so that $AB + BC$ is defined are

1. n is arbitrary, $q = 2$
2. $m = n, q = 3$
3. $q = 3, m = 3$
4. q is arbitrary, $n = 2$

Options:

- A. 1
- B. 2
- C. 3

D. 4

Answer: B

Solution:

Given $A : m \times n$, $B : n \times 3$, $C : 3 \times q$.

AB has order $m \times 3$, BC has order $n \times q$.

$AB + BC$ defined only if $m = n$ and $q = 3$.

Correct Option: (2)

Question11

Which of the following terms are associated with a linear programming problem?

- (A) Constraints
- (B) Independent events
- (C) Feasible region
- (D) Objective function

Choose the **correct** answer from the options given below:

1. (A) and (C) only
2. (A), (C) and (D) only
3. (B), (C) and (D) only
4. (A), (B) and (D) only

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: B

Solution:

The terms associated with linear programming problems are: constraints, feasible region, objective function.

The term “independent events” is associated with probability.

Correct Option: (2)

Question12

Which of the following functions has a local minima at $x = 0$?

(A) $f(x) = x^3$

(B) $f(x) = |x|$

(C) $f(x) = x^2$

(D) $f(x) = x^{-2}$

Choose the **correct** answer from the options given below:

1. (A), (B) and (C) only
2. (D) only
3. (B), (C) and (D) only
4. (B) and (C) only

Options:

- A. 1
B. 2
C. 3
D. 4

Answer: D

Solution:

(A) $f(x) = x^3$: $f'(0) = 0, f''(0) = 0$ inflection point.

(B) $f(x) = |x|$ minimum at $x = 0$.

(C) $f(x) = x^2$: $f'(0) = 0, f''(0) = 2 > 0$ local minimum.

(D) $f(x) = x^{-2}$ not defined at $x = 0$.

Hence only (B) and (C).

Correct Option: (4)

Question13

$\int_0^8 \left(x^{\frac{2}{3}} + 1 \right) dx$ is equal to

1. $\frac{28}{3}$
2. $\frac{25}{3}$
3. $\frac{184}{3}$
4. $\frac{136}{5}$

Options:

- A. 1
B. 2
C. 3
D. 4

Answer: D

Solution:

$$\int_0^8 (x^{\frac{2}{3}} + 1) dx = \left. \frac{3}{5} x^{\frac{5}{3}} + x \right|_0^8 = \frac{3}{5} \times 32 + 8 = \frac{96}{5} + \frac{40}{5} = \frac{136}{5}$$

Correct Option: (4)

Question14

Function $f(x) = x^x$, $x > 0$ decreases on the interval

1. $(0, \frac{1}{e})$
2. $(0, e)$
3. $(\frac{1}{e}, \infty)$
4. (e, ∞)

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: A

Solution:

$$f(x) = x^x = e^{x \ln x}, \quad f'(x) = x^x (\ln x + 1)$$

$$f'(x) = 0 \Rightarrow \ln x = -1 \Rightarrow x = \frac{1}{e}$$

$$f'(x) < 0 \Rightarrow \ln x < -1 \Rightarrow x < \frac{1}{e}$$

Decreasing on $(0, \frac{1}{e})$

Correct Option: (1)

Question15

If $x = at^2$, $y = 2at$; then $\frac{d^2y}{dx^2}$ is equal to

1. 0
2. $\frac{1}{t}$
3. $-\frac{1}{t^2}$
4. $-\frac{1}{2at^3}$

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: D

Solution:

$$x = at^2, y = 2at$$

$$\frac{dx}{dt} = 2at, \frac{dy}{dt} = 2a$$

$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{1}{t}$$

$$\frac{d(dy/dx)}{dt} = -\frac{1}{t^2}$$

$$\frac{d^2y}{dx^2} = \frac{-1/t^2}{dx/dt} = \frac{-1/t^2}{2at} = -\frac{1}{2at^3}$$

Correct Option: (4)

Applied Mathematics

Question1

A machine costing Rs.2,00,000 has a useful life of 5 years. The estimated scrap value is Rs.20,000. By using straight line method, the annual depreciation is

1. Rs.18,000
2. Rs.25,000
3. Rs.36,000
4. Rs.40,000

Options:

- A. 1
B. 2
C. 3
D. 4

Answer: C

Solution:

The given values are:

Cost of the Machine (C) = Rs. 2,00,000

Scrap Value (S) = Rs. 20,000

Useful Life (n) = 5 years

Step 1: Understand the Straight Line Method (SLM) Formula.

$$\text{Annual Depreciation} = \frac{\text{Cost of Asset} - \text{Scrap Value}}{\text{Estimated Useful Life}}$$

$$\text{Annual Depreciation} = \frac{C - S}{n}$$

Step 2: Substitute the values into the formula.

$$\text{Annual Depreciation} = \frac{2,00,000 - 20,000}{5}$$

Step 3: Perform the subtraction in the numerator.

$$\text{Total Depreciable Amount} = 1,80,000$$

Step 4: Divide by the useful life.

$$\text{Annual Depreciation} = \frac{1,80,000}{5} = 36,000$$

Conclusion: The annual depreciation is Rs. 36,000. The correct option is 3.

Question2

The binomial distribution for which the mean is 5 and variance 4 , is

1. $P(X = r) = {}^{25}C_r \left(\frac{4}{5}\right)^r \left(\frac{1}{5}\right)^{25-r}$, $r = 0, 1, 2, 3, \dots, 25$

2. $P(X = r) = {}^{25}C_r \left(\frac{1}{5}\right)^r \left(\frac{4}{5}\right)^{25-r}$, $r = 0, 1, 2, 3, \dots, 25$

3. $P(X = r) = {}^{25}C_r \left(\frac{1}{5}\right)^{25} \left(\frac{4}{5}\right)^{25-r}$, $r = 0, 1, 2, 3, \dots, 25$

4. $P(X = r) = {}^{25}C_r \left(\frac{1}{5}\right)^{25-r} \left(\frac{4}{5}\right)^{25}$, $r = 0, 1, 2, 3, \dots, 25$

Options:

A. 1

B. 2

C. 3

D. 4

Answer: B

Solution:

$$\text{Mean } np = 5$$

$$\text{Variance } npq = 4$$

$$\text{Dividing Variance by Mean: } \frac{npq}{np} = \frac{4}{5}$$

$$\text{So, } q = \frac{4}{5}$$

Since $p = 1 - q$, then $p = 1 - \frac{4}{5} = \frac{1}{5}$

Substitute p into the mean equation: $n(\frac{1}{5}) = 5$

$$n = 25$$

The formula for binomial distribution is: $P(X = r) = {}^nC_r p^r q^{n-r}$

Plugging in the values: $P(X = r) = {}^{25}C_r (\frac{1}{5})^r (\frac{4}{5})^{25-r}$

Correct Option: 2

Question3

The point which provides the optimal solution of the linear programming problem

maximize $z = 21x + 35y$

$$3x + 2y \leq 30$$

$$4x + 5y \leq 60$$

$$x \geq 0, y \geq 0$$

has the coordinates

1. $(\frac{30}{7}, \frac{60}{7})$
2. $(0, 12)$
3. $(10, 0)$
4. $(3, 8)$

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: B

Solution:

Step 1: Identify the corner points of the feasible region.

For $3x + 2y = 30$, the intercepts are $(10, 0)$ and $(0, 15)$.

For $4x + 5y = 60$, the intercepts are $(15, 0)$ and $(0, 12)$.

Step 2: Find the intersection of the two boundary lines.

$$15x + 10y = 150 \text{ (line 1 multiplied by 5)}$$

$$8x + 10y = 120 \text{ (line 2 multiplied by 2)}$$

$$\text{Subtracting gives } 7x = 30 \implies x = \frac{30}{7}, y = \frac{60}{7}$$

Step 3: Test corner points in $z = 21x + 35y$

$$\text{At } (10, 0): z = 21(10) + 35(0) = 210$$

$$\text{At } (0, 12): z = 21(0) + 35(12) = 420$$

$$\text{At } (\frac{30}{7}, \frac{60}{7}): z = 21(\frac{30}{7}) + 35(\frac{60}{7}) = 90 + 300 = 390$$

The maximum value is 420 at $(0, 12)$.

Correct Option: 2

Question4

If the matrix $A = \begin{bmatrix} x & 2 & y \\ -2 & 0 & 3 \\ -1 & z & 0 \end{bmatrix}$ is skew-symmetric, then the value of $2x - 3y + 5z$ is equal to

(1) 18

(2) 15

(3) -10

(4) -18

Options:

A. 1

B. 2

C. 3

D. 4

Answer: D

Solution:

For a skew-symmetric matrix, diagonal elements are zero and $a_{ij} = -a_{ji}$

Step 1: Find x from the diagonal element a_{11}

$$x = 0$$

Step 2: Find y and z using $a_{ij} = -a_{ji}$

$$a_{13} = -a_{31} \implies y = -(-1) = 1$$

$$a_{32} = -a_{23} \implies z = -(3) = -3$$

Step 3: Calculate $2x - 3y + 5z$

$$2(0) - 3(1) + 5(-3)$$

$$0 - 3 - 15 = -18$$

Correct Option: 4

Question5

Ram invested Rs. 20,000 in a mutual fund in the year 2012.

The value of the mutual fund increased to Rs. 32,000 in the year 2017.

The compound annual growth rate (CAGR) of his investment is (Given: $(1.6)^{\frac{1}{5}} = 1.098$)

1. 10.8%
2. 7.8%
3. 9.8%
4. 6.8%

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: C

Solution:

Principal (P) = 20,000, Amount (A) = 32,000

Time (n) = 2017 - 2012 = 5 years

Using Formula: $A = P(1 + r)^n$

$$32,000 = 20,000(1 + r)^5$$

$$\frac{32,000}{20,000} = (1 + r)^5 \implies 1.6 = (1 + r)^5$$

$$(1.6)^{\frac{1}{5}} = 1 + r$$

Substitute given value: $1.098 = 1 + r$

$$r = 1.098 - 1 = 0.098$$

Rate in percentage = $0.098 \times 100 = 9.8\%$

Correct Option: 3

Question6

If the system of equations $kx + y + z = 0$, $x + ky - z = 0$, $x - y + z = 0$ has a non-zero solution, then the possible values of k are

1. 1, 3
2. 1, -3
3. 2, 3
4. -1, 3

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: D

Solution:

For a homogeneous system of equations to have a non-zero solution, the determinant of its coefficient matrix must be zero.

$$\text{Expanding along the first row: } k(k(1) - (-1)(-1)) - 1(1(1) - (-1)(1)) + 1(1(-1) - k(1)) = 0$$

$$k(k - 1) - 1(1 + 1) + 1(-1 - k) = 0$$

$$k^2 - k - 2 - 1 - k = 0$$

$$k^2 - 2k - 3 = 0$$

$$\text{Factoring the quadratic equation: } (k - 3)(k + 1) = 0$$

$$k = 3 \text{ or } k = -1$$

Correct Option: 4

Question7

Choose the correct statement about Sinking Fund?

1. It is a long term account which can be closed any time.
2. It does not have any specific purpose.
3. In this fund, a fixed amount at regular intervals is deposited for a fixed terms
4. It can be used in any emergency.

Options:

- A. 1

- B. 2
- C. 3
- D. 4

Answer: C

Solution:

A Sinking Fund is a fund established by setting aside money periodically over a specified period of time to achieve a particular goal, such as repaying a debt or purchasing a future asset.

The correct characteristic is that a fixed amount at regular intervals is deposited for a fixed term.

Correct Option: 3

Question8

If $(t_1, y_1), (t_2, y_2), \dots, (t_n, y_n)$ denote the time series and y_t are the trend values of the variables y , then

1. $\sum_{i=1}^n (y_i - y_t) = 0$
2. $\sum_{i=1}^n (y_i - y_t) = 1$
3. $\sum_{i=1}^n (y_i - y_t) = \infty$
4. $\sum_{i=1}^n (y_i - y_t) \neq 0$

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: A

Solution:

In time series analysis, when the trend line is fitted using the method of least squares,

the sum of the deviations of the actual values (y_i) from the trend values (y_t) is zero.

This is a fundamental property of the least squares regression line.

Mathematically: $\sum_{i=1}^n (y_i - y_t) = 0$

Correct Option: 1

Question9

The two positive numbers whose sum is 16 and the sum of whose squares is minimum then the positive numbers are:

- 1. 6, 10
- 2. 7, 9
- 3. 8, 8
- 4. 5, 11

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: C

Solution:

Let the two positive numbers be x and y .

From the problem, their sum is 16: $x + y = 16 \implies y = 16 - x$

We want to minimize the sum of their squares, $S = x^2 + y^2$

Substitute y in the expression for S : $S = x^2 + (16 - x)^2$

To find the minimum, we take the derivative with respect to x and set it to 0:

$$\frac{dS}{dx} = 2x + 2(16 - x)(-1) = 2x - 32 + 2x = 4x - 32$$

Setting the derivative to zero: $4x - 32 = 0 \implies 4x = 32 \implies x = 8$

If $x = 8$, then $y = 16 - 8 = 8$

Therefore, the two positive numbers are 8 and 8.

Correct Option: 3

Question10

The cost of type 1 rice is Rs. 20 per kg and type 2 rice is Rs. 30 per kg. If both Type 1 and Type 2 are mixed in the ratio 2:3, then the price per kg of the mixed variety is

- 1. Rs. 26
- 2. Rs. 24
- 3. Rs. 30
- 4. Rs. 32

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: A

Solution:

Assume the quantity of Type 1 rice is 2 kg and the quantity of Type 2 rice is 3 kg.

Step 1: Calculate the total cost of each type

$$\text{Cost of Type 1 rice} = 2 \text{ kg} \times 20 \text{ Rs/kg} = \text{Rs. } 40$$

$$\text{Cost of Type 2 rice} = 3 \text{ kg} \times 30 \text{ Rs/kg} = \text{Rs. } 90$$

Step 2: Calculate the total cost and total quantity

$$\text{Total cost} = 40 + 90 = \text{Rs. } 130$$

$$\text{Total quantity} = 2 + 3 = 5 \text{ kg}$$

Step 3: Calculate the average price per kg

$$\text{Price per kg} = \frac{\text{Total Cost}}{\text{Total Quantity}} = \frac{130}{5} = \text{Rs. } 26$$

Correct Option: 1

Question11

The corner points of the bounded feasible region determined by the system of linear constraints are $(0,8)$, $(4,4)$, $(12,12)$, $(0,20)$. Let $z = px + qy$, where $p, q > 0$.Condition on p and q so that the maximum of z occurs at both the points $(12,12)$, $(0,20)$ is

1. $2p = q$
2. $p = 3q$
3. $2p = 3q$
4. $3p = 2q$

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: D

Solution:

The objective function is $z = px + qy$

According to the problem, the maximum value of z occurs at both $(12,12)$ and $(0,20)$.

Therefore, the value of z at these two points must be equal.

Step 1: Calculate z at $(12,12)$

$$z_{(12,12)} = p(12) + q(12) = 12p + 12q$$

Step 2: Calculate z at $(0,20)$

$$z_{(0,20)} = p(0) + q(20) = 20q$$

Step 3: Set the two values equal to each other

$$12p + 12q = 20q$$

$$12p = 20q - 12q$$

$$12p = 8q$$

Divide both sides by 4:

$$3p = 2q$$

Question12

A random variable X has the following probability distribution

X	0	1	2
P(X)	1/4	1/2	1/4

then, which of the following is correct?

1. mean = variance
2. 2 mean = variance
3. mean = 2 variance
4. 3 mean = 2 variance

Options:

A.

1

B.

2

C.

3

D.

4

Answer: C

Solution:

$$\text{Mean} = E(X) = 0 \times \frac{1}{4} + 1 \times \frac{1}{2} + 2 \times \frac{1}{4}$$

$$E(X) = \frac{1}{2} + \frac{1}{2} = 1$$

$$E(X^2) = 0^2 \times \frac{1}{4} + 1^2 \times \frac{1}{2} + 2^2 \times \frac{1}{4}$$

$$E(X^2) = \frac{1}{2} + 1 = \frac{3}{2}$$

$$\text{Variance} = E(X^2) - [E(X)]^2$$

$$= \frac{3}{2} - 1 = \frac{1}{2}$$

$$\text{Thus, mean} = 1 \text{ and variance} = \frac{1}{2}$$

$$\text{Mean} = 2 \times \text{Variance}$$

Therefore, option 3 is correct

Question13

Assuming the same rate of change continues for the following data:

Year(X)	2019	2020	2021	2022	2023
Profit in Percentage (y)	38	40	65	72	69

The equation of the straight line trend using the least square method is:

1. $y = 9.4x + 18940.6$

2. $y = 9.4x - 18940.6$

3. $y = 9.4x + 56.8$

4. $y = 9.4x - 56.8$

Options:

A.

1

B.

2

C.

3

D.

4

Answer: B

Solution:

Let $n = 5$. Let the middle year (2021) be the origin, so $X = x - 2021$.

The values of X are: -2, -1, 0, 1, 2. Note that $\sum X = 0$.

Calculate the necessary sums:

$$\sum y = 38 + 40 + 65 + 72 + 69 = 284$$

$$\sum X^2 = (-2)^2 + (-1)^2 + 0^2 + 1^2 + 2^2 = 4 + 1 + 0 + 1 + 4 = 10$$

$$\sum Xy = (-2 \cdot 38) + (-1 \cdot 40) + (0 \cdot 65) + (1 \cdot 72) + (2 \cdot 69) = -76 - 40 + 0 + 72 + 138 = 94$$

Find the constants a and b for the equation $y = a + bX$:

$$a = \frac{\sum y}{n} = \frac{284}{5} = 56.8$$

$$b = \frac{\sum Xy}{\sum X^2} = \frac{94}{10} = 9.4$$

Substitute $X = x - 2021$ back into the trend equation $y = 56.8 + 9.4(x - 2021)$:

$$y = 56.8 + 9.4x - 18997.4$$

$$y = 9.4x - 18940.6$$

Correct Option: 2

Question14

Which of the following statements are TRUE?

- (A) The variable t of t-distribution ranges from $-\infty$ to ∞ .
- (B) The probability curve of the t-distribution is symmetric about the line $t=0$
- (C) The variance of the t-distribution is greater than one.
- (D) As the number of degrees of freedom decreases, the t-distribution curve moves closer to the standard normal probability curve.

Choose the correct answer from the options given below:

- 1. (A), (B) and (D) only
- 2. (A), (B) and (C) only
- 3. (A), (B), (C) and (D)
- 4. (C) and (D) only

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: B

Solution:

Analysis of statements:

(A) TRUE: The t-distribution is defined from $-\infty$ to ∞ .

(B) TRUE: Like the normal distribution, it is bell-shaped and symmetric about 0.

(C) TRUE: The variance is $\frac{v}{v-2}$ (for $v > 2$), which is always > 1 .

(D) FALSE: As degrees of freedom **increase**, the curve approaches the standard normal.

Since A, B, and C are true, option 2 is correct.

Correct Option: 2

Question15

If $\frac{3x-5}{6} + 8 \geq 4 + \frac{2x}{3}$, then

1. $x \in (-\infty, 19]$
2. $x \in (-\infty, -19]$
3. $x \in [19, \infty)$
4. $x \in [-19, \infty)$

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: A

Solution:

Step 1: Simplify constants by subtracting 4 from both sides

$$\frac{3x-5}{6} + 4 \geq \frac{2x}{3}$$

Step 2: Multiply the entire inequality by 6 to clear denominators

$$(3x-5) + 6(4) \geq 6(\frac{2x}{3})$$

$$3x-5+24 \geq 4x$$

Step 3: Simplify the left side

$$3x+19 \geq 4x$$

Step 4: Subtract 3x from both sides to isolate x

$$19 \geq x \text{ or } x \leq 19$$

Step 5: Represent the solution in interval notation

$$x \in (-\infty, 19]$$

Correct Option: 1

Question16

The sum of the order and degree of the differential equation representing the family of curves $y = mx + m^4$, where m is arbitrary constant, is

1. 3
2. 4
3. 5
4. 2

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: C

Solution:

First, form the differential equation by differentiating $y = mx + m^4$ with respect to x :

$$\frac{dy}{dx} = m$$

Substitute $m = \frac{dy}{dx}$ back into the original curve equation:

$$y = \left(\frac{dy}{dx}\right)x + \left(\frac{dy}{dx}\right)^4$$

In this equation:

1. The highest order derivative is $\frac{dy}{dx}$, so Order = 1.

2. The power of the highest order derivative is 4, so Degree = 4.

Sum of order and degree = $1 + 4 = 5$.

Correct Option: 3

Question17

If $A = \begin{bmatrix} 3 & 2a \\ 1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ b & 5 \end{bmatrix}$ are singular matrices, then $a + b$ is:

1. $\frac{6}{65}$

2. $\frac{67}{6}$

3. $\frac{65}{6}$

4. $\frac{1}{66}$

Options:

A. 1

B. 2

C. 3

D. 4

Answer: C

Solution:

A matrix is singular if its determinant is zero.

$$\text{For A: } (3 \times 5) - (1 \times 2a) = 0 \implies 15 - 2a = 0 \implies a = \frac{15}{2}$$

$$\text{For B: } (2 \times 5) - (b \times 3) = 0 \implies 10 - 3b = 0 \implies b = \frac{10}{3}$$

$$\text{Calculate } a + b = \frac{15}{2} + \frac{10}{3} = \frac{45 + 20}{6} = \frac{65}{6}$$

Correct Option: 3

Question18

The value of $\int_2^4 \frac{x}{x^2 + 1} dx$ is equal to:

1. $\frac{1}{2} \log_e \left(\frac{17}{5} \right)$

2. $\frac{1}{5} \log_e \left(\frac{17}{5} \right)$

$$3. \log_e \left(\frac{17}{5} \right)$$

$$4. 2 \log_e \left(\frac{17}{5} \right)$$

Options:

A. 1

B. 2

C. 3

D. 4

Answer: A

Solution:

Use substitution method: Let $u = x^2 + 1 \implies du = 2x \, dx$ or $x \, dx = \frac{1}{2} du$

Change limits: When $x = 2, u = 5$. When $x = 4, u = 17$.

$$\int_5^{17} \frac{1}{2u} du = \frac{1}{2} [\log_e u]_5^{17}$$

$$= \frac{1}{2} (\log_e 17 - \log_e 5) = \frac{1}{2} \log_e \left(\frac{17}{5} \right)$$

Correct Option: 1

Question19

The least non-negative remainder, when 5^{61} is divided by 7, is

1. 6

2. 4

3. 5

4. 2

Options:

A. 1

B. 2

C. 3

D. 4

Answer: C

Solution:

Using modular arithmetic $\pmod{7}$:

$$5^1 \equiv 5 \pmod{7}$$

$$5^2 \equiv 25 \equiv 4 \pmod{7}$$

$$5^3 \equiv 125 \equiv 6 \equiv -1 \pmod{7}$$

$$\text{Since } 5^3 \equiv -1 \pmod{7}, \text{ then } (5^3)^{20} \equiv (-1)^{20} \pmod{7}$$

$$5^{60} \equiv 1 \pmod{7}$$

$$5^{61} = 5^{60} \cdot 5^1 \equiv 1 \cdot 5 \equiv 5 \pmod{7}$$

The remainder is 5.

Correct Option: 3

Question20

The length of a rectangle is decreasing at the rate of 4 cm/minute and the width is increasing at the rate of 3 cm/minute , then the rate of change of the perimeter is

1. 2 cm/min decreasing
2. 3 cm/min decreasing
3. 2 cm/min increasing
4. 3 cm/min increasing

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: A

Solution:

Let l = length and w = width. Given: $\frac{dl}{dt} = -4$ cm/min, $\frac{dw}{dt} = 3$ cm/min.

$$\text{Perimeter } P = 2(l + w)$$

Differentiate with respect to time t :

$$\frac{dP}{dt} = 2 \left(\frac{dl}{dt} + \frac{dw}{dt} \right)$$

$$\frac{dP}{dt} = 2(-4 + 3) = 2(-1) = -2 \text{ cm/min}$$

A negative result indicates the perimeter is decreasing.

Correct Option: 1

Question21

The following data are from a random sample: 5, 8, 10, 7, 10, 14, then the point estimate of the population standard deviation is

1. 2.1
2. 4.1
3. 5.6
4. 3.1

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: D

Solution:

$$\text{Mean } \bar{x} = \frac{5 + 8 + 10 + 7 + 10 + 14}{6} = \frac{54}{6} = 9$$

$$\text{Sample Variance } s^2 = \frac{\sum (x_i - \bar{x})^2}{n - 1}$$

$$\sum (x_i - \bar{x})^2 = (5 - 9)^2 + (8 - 9)^2 + (10 - 9)^2 + (7 - 9)^2 + (10 - 9)^2 + (14 - 9)^2$$

$$= 16 + 1 + 1 + 4 + 1 + 25 = 48$$

$$s = \sqrt{\frac{48}{5}} = \sqrt{9.6} \approx 3.1$$

Correct Option: 4

Question22

If X is a random variable and a, b are real numbers, which statements are TRUE?

(A) $Var(aX + b) = a^2 Var(X)$

(B) $E(aX + b) = aE(X) + b$

(C) $E(aX + b) = aE(X) - E(b)$

(D) $Var(aX + b) = aVar(X) + b$

Choose the correct answer:

1. (A) and (B) only
2. (A) and (C) only
3. (B) and (D) only
4. (A), (C) and (D) only

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: A

Solution:

1. Variance: $Var(aX + b) = a^2 Var(X)$ because variance is unaffected by shifts (b).

2. Expectation: $E(aX + b) = aE(X) + b$ due to linearity.

Statements (C) and (D) are mathematically incorrect definitions.

Correct Option: 1

Question23

Pipe A and B can fill a tank in 20 hours and 25 hours respectively, and pipe C can empty it in 40 hours. If all the pipes are opened together, then how much time will be needed to make the tank full?

1. $15\frac{1}{13}$ hours
2. $15\frac{4}{13}$ hours
3. $15\frac{5}{13}$ hours
4. $15\frac{3}{13}$ hours

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: C

Solution:

$$\text{Solution: Combined work rate per hour: Rate} = \frac{1}{20} + \frac{1}{25} - \frac{1}{40}.$$

$$\text{Find a common denominator (200): Rate} = \frac{10}{200} + \frac{8}{200} - \frac{5}{200} = \frac{13}{200} \text{ tank per hour.}$$

$$\text{Time taken} = \frac{1}{\text{Rate}} = \frac{200}{13} \text{ hours.}$$

$$200 \div 13 = 15 \text{ with remainder } 5.$$

$$\text{Time} = 15\frac{5}{13} \text{ hours.}$$

Final Answer: Option 3 is correct.

Question24

Question: Choose the correct statement about CAGR (compound annual growth rate)?

1. CAGR is the average annualized return of an investment.
2. CAGR is calculated by taking arithmetic mean of series of returns.
3. CAGR is linear measure that does not account for the effects of compounding.
4. CAGR is calculated by using the final and beginning value of an investment.

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: D

Solution:

Step 1: Analyze the definition and formula of CAGR.

The CAGR formula is:
$$\text{CAGR} = \left(\frac{\text{Ending Value}}{\text{Beginning Value}} \right)^{\frac{1}{n}} - 1$$

where n is the number of years.

Step 2: Evaluate the provided options.

Option 2 is incorrect because CAGR is a geometric mean, not an arithmetic mean.

Option 3 is incorrect because CAGR specifically accounts for compounding effects.

Option 1 and 4 are both relevant, but Option 4 describes the technical requirement for the calculation (it only needs the start and end values, ignoring volatility in between).

Step 3: Determine the most precise answer based on standard finance definitions.

In most academic contexts, CAGR is defined by its ability to provide a smoothed annual yield based solely on the beginning and ending values.

Final Answer: Option 4 is the most technically accurate description of how it is calculated.

Question25

The break-even point is the level of production where

- 1. the revenue from sales is less then the cost of production and marketing.**
- 2. the revenue from sales is equal to the cost of production and marketing.**
- 3. the revenue from sales is greater then the cost of production and marketing.**
- 4. the sum of revenue from sales and the cost of production and marketing is zero**

Options:

- A. 1
- B. 2

C. 3

D. 4

Answer: B

Solution:

Step 1: Define the concept of a break-even point in business and economics.

The break-even point is the production level where there is neither profit nor loss.

Step 2: Formulate the relationship between Revenue and Cost at this point.

Profit = Total Revenue - Total Cost

At the break-even point, Profit = 0, which implies: Total Revenue = Total Cost.

Step 3: Match this definition with the provided options.

Option 2 states that revenue is equal to the total cost (production and marketing).

Answer: Option 2 is correct.

Question26

Question: If $A = \begin{bmatrix} 5 & 2 \\ 4 & 3 \end{bmatrix}$ is a given matrix, then which statements are correct?

(A) $|A| = 7$

(B) minor of 3 = -5

(C) co-factor of 2 = -4

(D) $adj(A) = \begin{bmatrix} 3 & -2 \\ -4 & 5 \end{bmatrix}$

1. (A), (C) and (D) only
2. (A), (B) and (C) only
3. (B), (C) and (D) only
4. (A), (B) and (D) only

Options:

A. 1

B. 2

C. 3

D. 4

Answer: A

Solution:

Step 1: Calculate the Determinant $|A|$.

$$|A| = (5 \times 3) - (2 \times 4) = 15 - 8 = 7. \text{ (Statement A is TRUE)}$$

Step 2: Find the Minor of 3. Element 3 is at a_{22} . Its minor is the

determinant of the submatrix left after removing row 2 and column 2, which is 5.

(Statement B is FALSE because it says -5)

Step 3: Find the Co-factor of 2. Element 2 is at a_{12} . Sign is $(-1)^{1+2} = -1$.

Minor of 2 is 4. Co-factor $= (-1) \times 4 = -4$. (Statement C is TRUE)

Step 4: Find the Adjoint. For a 2×2 matrix, swap the main diagonal

elements and change the signs of the off-diagonal elements.

$$\text{adj}(A) = \begin{bmatrix} 3 & -2 \\ -4 & 5 \end{bmatrix}. \text{ (Statement D is TRUE)}$$

Conclusion: A, C, and D are correct.

Final Answer: Option 1

Question27

Question: For the following data:

	Size	Mean	Standard Deviation
Sample 14	40	8	
Sample 25	50	10	

The sample statistic t follows t -distribution with 'm' degrees of freedom, then m is equal to:

1. 11
2. 10
3. 7
4. 9

Options:

A.

1

B.

2

C.

3

D.

4

Answer: C

Solution:

Step 1: Identify the given information for both samples.

$$n_1 = 4 \text{ (Size of Sample 1)}$$

$$n_2 = 5 \text{ (Size of Sample 2)}$$

Step 2: Recall the formula for degrees of freedom (m) for a two-sample t-test.

$$\text{The pooled degrees of freedom are calculated as: } m = n_1 + n_2 - 2$$

Step 3: Substitute the values into the formula.

$$m = 4 + 5 - 2$$

$$m = 9 - 2 = 7$$

Final Answer: Option 3 (7) is correct.

Question 28

If A is a square matrix such that $A^2 = A$ and I is the identity matrix of the same order as A , then $(I + 2A)^2 - 5A$ is equal to:

1. $I + 2A$
2. $I + 3A$
3. $I + A$
4. I

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: B

Solution:

Step 1: Expand the expression $(I + 2A)^2$.

Using the property $(X + Y)^2 = X^2 + XY + YX + Y^2$ for matrices:

$$(I + 2A)^2 = I^2 + I(2A) + (2A)I + (2A)^2$$

Step 2: Simplify using properties of the identity matrix I and scalars.

$$\bullet I^2 = I$$

$$\bullet I(2A) = 2A \text{ and } (2A)I = 2A$$

$$\bullet (2A)^2 = 4A^2$$

$$\text{So, } (I + 2A)^2 = I + 2A + 2A + 4A^2 = I + 4A + 4A^2$$

Step 3: Substitute the given condition $A^2 = A$.

$$(I + 2A)^2 = I + 4A + 4(A)$$

$$(I + 2A)^2 = I + 8A$$

Step 4: Subtract $5A$ as per the original expression.

$$\text{Expression} = (I + 8A) - 5A$$

$$\text{Expression} = I + 3A$$

Step 5: Conclusion.

The value of the expression is $I + 3A$.

The correct option is 2.

Question29

The curve $y = f(x)$ is normal probability curve, then which of the following statements are correct?

- (A) mean, median and mode of the distribution coincide.
- (B) the area bounded by the curve $y = f(x)$ and x-axis is one unit.
- (C) The curve is symmetrical about the line $x = \mu$, where μ is the mean.
- (D) y-axis is an asymptote to the curve.

Choose the correct answer from the options given below:

- 1. (A), (B) and (C) only
- 2. (A), (C) and (D) only
- 3. (B) and (D) only
- 4. (B), (C) and (D) only

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: A

Solution:

Statement (A): Mean, median, and mode coincide at the peak. (Correct)

Statement (B): Total area under the normal curve and above the x-axis is 1. (Correct)

Statement (C): The curve is symmetric about the line $x = \mu$. (Correct)

Statement (D): The x-axis is the horizontal asymptote, not the y-axis. (Incorrect)

Conclusion: Statements (A), (B), and (C) are correct.

Correct Option: 1. (A), (B) and (C) only

Question30

In a kilometer race , A beats B by 50 meters or by 5 seconds, then the time taken by A to complete the race is

- 1. 85 seconds
- 2. 90 seconds
- 3. 95 seconds
- 4. 120 seconds

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: C

Solution:

Given: A beats B by 50 meters or by 5 seconds

This means B takes 5 seconds to cover the remaining 50 meters

Step 1: Calculate Speed of B

$$\text{Speed of B} = \frac{50 \text{ meters}}{5 \text{ seconds}} = 10 \text{ m/s}$$

Step 2: Calculate total time taken by B to finish 1 kilometer (1000 meters)

$$\text{Time taken by B} = \frac{1000 \text{ meters}}{10 \text{ m/s}} = 100 \text{ seconds}$$

Step 3: Calculate time taken by A

Since A beats B by 5 seconds, A finishes 5 seconds earlier

$$\text{Time taken by A} = 100 \text{ seconds} - 5 \text{ seconds} = 95 \text{ seconds}$$

Correct Option: 3

Question31

The demand for a certain product is represented by the function

$$p = 150 + 10x - x^2 \text{ (in Rs.)}$$

where x is the number of units demanded and p is the price per unit, then the value of marginal revenue , when 10 units are sold, is

1. Rs.50
2. Rs.100
3. Rs.150
4. Rs.200

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: A

Solution:

Step 1: Identify the given demand (price) function

$$p = 150 + 10x - x^2$$

Step 2: Calculate the Total Revenue (R) function, where R = price · quantity

$$R = p \cdot x = (150 + 10x - x^2)x$$

$$R = 150x + 10x^2 - x^3$$

Step 3: Find the Marginal Revenue (MR) by differentiating Total Revenue with respect to x

$$MR = \frac{dR}{dx} = \frac{d}{dx}(150x + 10x^2 - x^3)$$

$$MR = 150 + 20x - 3x^2$$

Step 4: Substitute x = 10 units to find the specific value

$$MR = 150 + 20(10) - 3(10)^2$$

$$MR = 150 + 200 - 3(100)$$

$$MR = 350 - 300$$

$$MR = 50$$

Conclusion: The value of marginal revenue is Rs. 50 (Option 1)

Question32

Mr. Vishnu has an initial investment of Rs. 80,000 in an investment plan. After 3 years, it has grown to Rs. 1,00,000, then his rate of return is

1. 30%
2. 25%
3. 20%
4. 10%

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: B

Solution:

Step 1: Identify the given values

Initial Investment (Principal) = Rs. 80,000

Final Amount = Rs. 1,00,000

Step 2: Calculate the total gain (return)

Total Gain = Final Amount - Initial Investment

Total Gain = 1,00,000 - 80,000 = 20,000

Step 3: Calculate the Rate of Return percentage

Rate of Return = $\frac{\text{Total Gain}}{\text{Initial Investment}} \cdot 100$

Rate of Return = $\frac{20,000}{80,000} \cdot 100$

Rate of Return = $\frac{1}{4} \cdot 100$

Rate of Return = 25%

Conclusion: The rate of return is 25% (Option 2)

Question33

Which of the following statements are TRUE ?

- (A) The sales of woolen clothes, gold , silver etc. exhibit seasonal trends.
- (B) The price of stocks in the share market repeats after a definite time interval.
- (C) The rise and fall of the share market is an example of a cyclic trend.
- (D) The rise in prices before festivals is an example of a irregular trend.

Choose the correct answer from the options given below:

- 1. (A) and (D) only
- 2. (A), (B) and (C) only
- 3. (A) and (C) only
- 4. (B), (C) and (D) only

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: C

Solution:

Statement (A): Seasonal trends occur within a year due to climate or customs. Woolen sales are seasonal. (True)

Statement (B): Stock market prices do not repeat at "definite" intervals; they are unpredictable. (False)

Statement (C): Cyclic trends represent long-term oscillations (rise and fall) over several years. (True)

Statement (D): Festival-related price rises are predictable/seasonal, not irregular (random). (False)

Conclusion: Statements (A) and (C) are correct. (Option 3)

Question34

For the given five values, 16, 25, 19, 34, 43, the three year moving averages are

- 1. 20, 26, 32
- 2. 20, 26, 33
- 3. 20, 27, 32
- 4. 20, 26, 31

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: A

Solution:

Step 1: Calculate the first moving average (Average of 1st, 2nd, and 3rd values)

$$\text{Average 1} = \frac{16 + 25 + 19}{3} = \frac{60}{3} = 20$$

Step 2: Calculate the second moving average (Average of 2nd, 3rd, and 4th values)

$$\text{Average 2} = \frac{25 + 19 + 34}{3} = \frac{78}{3} = 26$$

Step 3: Calculate the third moving average (Average of 3rd, 4th, and 5th values)

$$\text{Average 3} = \frac{19 + 34 + 43}{3} = \frac{96}{3} = 32$$

Conclusion: The moving averages are 20, 26, 32 (Option 1)

Question35

A man rows downstream 30 km and upstream 20 km. If he takes 5 hours to cover each distance, then the speed of stream is

- 1. 5 km/hr
- 2. 1 km/hr
- 3. 4 km/hr
- 4. 6 km/hr

Options:

- A. 1
- B. 2
- C. 3
- D. 4

Answer: B

Solution:

Step 1: Calculate the Downstream and Upstream speeds

$$\text{Downstream Speed (D)} = \frac{\text{Downstream Distance}}{\text{Time}} = \frac{30 \text{ km}}{5 \text{ hours}} = 6 \text{ km/hr}$$

$$\text{Upstream Speed (U)} = \frac{\text{Upstream Distance}}{\text{Time}} = \frac{20 \text{ km}}{5 \text{ hours}} = 4 \text{ km/hr}$$

Step 2: Apply the formula for the speed of the stream

$$\text{Speed of Stream (v)} = \frac{\text{Downstream Speed (D)} - \text{Upstream Speed (U)}}{2}$$

$$v = \frac{6 - 4}{2} \text{ km/hr}$$

$$v = \frac{2}{2} \text{ km/hr} = 1 \text{ km/hr}$$

Conclusion: The speed of the stream is 1 km/hr (Option 2)
