21819

3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : **10**

(a) Prove that $\frac{1}{\log_3 6}+\frac{1}{\log_8 6}+\frac{1}{\log_9 6}=3.$

(b) Find x, if $\begin{vmatrix} 4 & 3 & 9 \\ 3 & -2 & 7 \\ 11 & 4 & x \end{vmatrix} = 0.$

(c) Without using calculator, find the value of cos(105°).

(d) The area of a rectangular garden is 3000 m^2. Its sides are in the ratio 6 : 5. Find the perimeter of the garden.

(e) Find the area of ring between two concentric circles whose circumferences are 75 cm and 55 cm.

(f) Find the range and coefficient of range 40, 52, 47, 28, 45, 36, 47, 50.

(g) The two sets of observations are given below :

Set I	**Set II**
$\bar{x} = 82.5$	$\bar{x} = 48.75$
$\sigma = 7.3$	$\sigma = 8.35$

Which of two sets is more consistent ?

2. Attempt any THREE of the following : **12**

(a) Solve the equations by Cramer's rule :

$x + y + z = 3, x - y + z = 1, x + y - 2z = 0$

(b) If $A = \begin{bmatrix} 2 & 4 & 4 \\ 4 & 2 & 4 \\ 4 & 4 & 2 \end{bmatrix}$, find $A^2 - 8A$.

(c) Resolve into partial fractions

$$\frac{3x+2}{(x+1)(x^2-1)}$$

(d) A metal strip having sides 17 × 7× 5 cm is melted down and minted into coins each of diameter 1.4 cm and thickness 0.08 cm. Assuming no wastage, how many coins can be minted ?

3. Attempt any THREE of the following : **12**

(a) Prove that

$\tan 70° - \tan 50° - \tan 20° = \tan 70° \tan 50° \tan 20°$.

(b) Prove that $\frac{1+\sin\theta-\cos\theta}{1+\sin\theta+\cos\theta} = \tan\left(\frac{\theta}{2}\right)$.

(c) Prove that $\frac{\cos 2A + 2\cos 4A + \cos 6A}{\cos A + 2\cos 3A + \cos 5A} = \cos A - \sin A \tan 3A$

(d) Prove that

$$\sin 20° \sin 40° \sin 60° \sin 80° = \frac{3}{16}$$

4. Attempt any THREE of the following : **12**

(a) Find the adjoint of matrix

$$A = \begin{bmatrix} 2 & 5 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$$

(b) Resolve into partial fractions

$$\frac{x^4}{x^3+1}$$

(c) Prove that $\tan^{-1}(1) + \tan^{-1}(2) + \tan^{-1}(3) = \pi$.

(d) Prove that

$$\sin^{-1}\left(\frac{3}{5}\right) - \sin^{-1}\left(\frac{8}{17}\right) = \cos^{-1}\left(\frac{84}{85}\right)$$

(e) Without using calculator, prove that

$$\sin 420° \cos 390° + \cos(-300°) \sin(-330°) = 1$$

5. Attempt any TWO of the following : **12**

(a) Attempt the following :

(i) Find the acute angle between the lines $y = 5x + 6$ and $y = x$.

(ii) Find the equation of the line passing through the point (4,5) and perpendicular to the line $7x - 5y = 420$.

(b) Attempt the following :

(i) Find the length of perpendicular from the point (2,3) on the line $4x - 6y - 3 = 0$.

(ii) Find the equation of the line passing through (1,7) and having slope 2 units.

P.T.O.

(c) Attempt the following :

(i) A square grassy plot is of side 100 metres. It has a gravel path 10 meters wide all round it on the inside. Find the area of the path.

(ii) The volume of a sphere is $\frac{88}{21}$ cubic meters. Find its surface area.

6. Attempt any TWO of the following : **12**

(a) (i) Find the mean deviation from mean of the following distribution :

C.I.	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
f_i	5	8	15	16	6

(ii) Find range & coefficient of range for the following data :

C.I.	10 – 19	20 – 29	30 – 39	40 – 49	50 – 59
f	15	25	13	17	10

(b) Calculate standard deviation and coefficient of variance of the following table :

Marks below	5	10	15	20	25
No. of Students	6	16	28	38	46

(c) Solve the following equations by using matrix inversion method :

$x + y + z = 6,\ 3x - y + 3z = 10,\ 5x + 5y - 4z = 3$

22103

21222

3 Hours / 70 Marks Seat No. | | | | | | | | |

15 minutes extra for each hour

Instructions – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Solve any FIVE of the following: **10**

a) Find value of $\log\left(\frac{2}{3}\right) + \log\left(\frac{4}{5}\right) - \log\left(\frac{8}{15}\right)$.

b) Show that the points (8, 1), (3, –4), (2, –5) are collinear.

c) Without using calculator find value of $\sin(105°)$.

d) Find area of Rhombus where diagonals are of length 6 cm and 9 cm.

e) Find surface area of cuboid whose dimensions are 8 cm × 11 cm × 15 cm.

f) If coefficient of variance is 5 and mean is 60. Find standard deviation.

g) Find range and coefficient of range for the data: 40, 52, 47, 28, 45, 36, 47, 50.

h) Find surface area of sphere whose volume is $\frac{4\pi}{3}$ cm^3.

Marks

2. Solve any THREE of the following: **12**

a) If $A = \begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$ prove that $A^2 = I$.

b) Resolve following into partial fraction $\frac{x + 3}{(x - 1)(x + 1)(x + 5)}$

c) Following results are obtained as a result of experiment. Find V_1, V_2, V_3 by using Cramer's Rule.
$V_1 + V_2 + V_3 = 9$, $V_1 - V_2 + V_3 = 3$, $V_1 + V_2 - V_3 = 1$

d) Compute mean deviation for the mean of the data:
12, 6, 7, 3, 15, 10, 18, 5.

3. Solve any THREE of the following: **12**

a) Solve without using calculator,
$\sin(420°)\cos(390°) + \sin(-330°)\cos(-300°)$

b) Prove : $\frac{\sin 4\theta + \sin 2\theta}{1 + \cos 2\theta + \cos 4\theta} = \tan 2\theta$

c) Prove that : $\frac{\sin 4A + \sin 5A + \sin 6A}{\cos 4A + \cos 5A + \cos 6A} = \tan 5A$

d) Prove : $\tan^{-1}\left(\frac{1}{8}\right) + \tan^{-1}\left(\frac{1}{5}\right) = \tan^{-1}\left(\frac{1}{3}\right)$

4. Solve any THREE of the following: **12**

a) Find x and y if

$$\left\{4\begin{bmatrix} 1 & 2 & 0 \\ 2 & -1 & 3 \end{bmatrix} - 2\begin{bmatrix} 1 & 3 & -1 \\ 2 & -3 & 4 \end{bmatrix}\right\}\begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$$

b) Resolve into partial fractions: $\frac{3x - 2}{(x + 2)(x^2 + 4)}$

c) Prove : $\cos 20°.\ \cos 40°.\ \cos 80° = \frac{1}{8}$

Marks

d) If $\tan(x + y) = \frac{3}{4}$ and $\tan(x - y) = \frac{1}{3}$. Find $\tan 2x$.

e) If $\sin A = \frac{1}{2}$. Find $\sin 3A$.

5. Solve any TWO of the following: **12**

a) Attempt the following:

i) Find equation of line passing through points $(6, -4)$ and $(-3, 8)$.

ii) Find distance between parallel lines $3x + 2y - 5 = 0$ and $3x + 2y - 6 = 0$.

b) Attempt the following:

i) Find equation of line passing through point $(2, 0)$ and perpendicular to $x + y + 3 = 0$.

ii) Find acute angle between the lines $3x - y + 4 = 0$ and $2x + y = 3$.

c) Attempt the following:

i) Find the area of ring between two concentric circles whose circumferences are 77 cm and 55 cm.

ii) The area of piece of land is in the form of a quadrilateral ABCD. The diagonal AC is 400 m long off-set to B is 220 m and off-set to D is 98 m. Find the area.

Marks

6. Solve any TWO of the following: **12**

a) Find the mean and standard deviation and coefficient of variance of the following data:

Class interval	0-10	10-20	20-30	30-40	40-50
Frequency	3	5	8	3	1

b) Attempt the following:

i) Find range and coefficient of range for following data:

Marks	10-19	20-29	30-39	40-49	50-59	60-69
No. of students	6	10	16	14	8	4

ii) The two sets of observations are given below:

Set I	Set II
$\bar{x}$ = 82.5 σ = S.D = 7.3	$\bar{x}$ = mean = 48.75 σ = S.D = 8.35

Which of two sets is more consistent?

c) Solve the following equations by matrix inversion method.
$x + y + z = 3$, $x + 2y + 3z = 4$, $x + 4y + 9z = 6$.

22232

3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : **10**

(a) Solve : $\log(x + 3) + \log(x - 3) = 10916$.

(b) Using determinant find the area of a triangle whose vertices are :

(4, 5), (0, 7) and (–1, 1).

(c) Without using calculator find the value of tan (15°).

(d) Find the area of a plot in the form of a rhombus having diagonals 160 m and 210 m long.

(e) Find the area between two concentric circles of radius 4 m and 2 m.

(f) Following are the prices (in ₹) of shares of a company for six days of a week :

200, 210, 208, 100, 220, 250. Calculate the Range.

(g) The mean and S.D. of a particular distribution are 60 and 5 respectively. Find the co-efficient of variation.

2. Attempt any THREE of the following : **12**

(a) Resolve into partial fractions : $\frac{x^2 + 5x + 7}{(x-1)(x+2)(x+4)}$.

(b) If $P = \begin{bmatrix} 1 & 2 & -3 \\ 3 & -1 & 2 \\ -2 & 1 & 3 \end{bmatrix}$, $Q = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 1 & 2 \\ 1 & 2 & 3 \end{bmatrix}$ then find the matrix R such that P + Q + R = O.

(c) The sum of three numbers is 2. If twice the second number is added to the sum of first and third, we get 1. On adding the sum of second and third numbers to five times the first number, we get 6. Find the three numbers using Cramer's Rule.

(d) Find the mean deviation from mean for the following distribution :

xi :	20	18	16	14	12	10	8	6
fi :	2	4	9	18	27	25	14	1

3. Attempt any THREE of the following : **12**

(a) If $\tan x = -3/4$, $3\pi/2 < x < 2\pi$, then find (i) $\sin 2x$ (ii) $\cos 2x$

(b) Prove that : $\sqrt{2 + \sqrt{2 + \sqrt{2 + 2\cos 4\theta}}} = 2\cos(\theta/2)$

(c) Prove that : $\sin 20° \sin 40° \sin 60° \sin 80° = 3/16$

(d) Prove that : $\tan^{-1}(1) + \tan^{-1}(2) + \tan^{-1}(3) = \pi$

4. Attempt any THREE of the following : **12**

(a) If $A = \begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$, show that $A^2 = I$.

(b) Resolve into partial fractions : $\frac{x^2 + 23x}{(x+3)(x^2+1)}$

(c) In a ΔABC, prove that :

$\tan A + \tan B + \tan C = \tan A \cdot \tan B \cdot \tan C$

(d) Prove that : $\sin 420° \cos 390° + \cos(-300°) \sin(-330°) = 1$.

(e) Prove that : $\frac{\sin 16\theta}{\sin \theta} = 16 \cos\theta \cdot \cos 2\theta \cdot \cos 4\theta \cdot \cos 8\theta$

5. Attempt any TWO of the following : **12**

(a) (i) If the slope of a line passing through the points (4, K) and (–2, –5) is 2, then find K.

(ii) Find the equation of a line making an angle of 120° with X-axis and passing through (2, 3).

(b) (i) Find the angle between the lines $x + 5y = 11$ and $5x - y = 11$.

(ii) Find the perpendicular distance of the point (–3, –4) from the line $4(x + 2) = 3(y - 4)$.

(c) (i) Find the area in hectare of the piece of land in the form of a quadrilateral ABCD. The diagonal AC is 400 m long and offset to B is 220 m and offset to D is 98 m.

(ii) A rectangular box 80 × 50 × 30 m is to be painted from outside at the rate of ₹ 1.25 per sq. m. Find the cost of painting it.

6. Attempt any TWO of the following : **12**

(a) Solve the following equations by matrix inversion method :

$x + 3y + 2z = 6$, $3x - 2y + 5z = 5$, $2x - 3y + 6z = 7$

(b) The score of two batsmen A and B in ten innings during a certain season are as under :

A : 32, 28, 47, 63, 71, 39, 10, 60, 96, 14

B : 19, 31, 48, 53, 67, 90, 10, 62, 40, 80

Find which of the two batsmen is more consistent using co-efficient of variation.

(c) Calculate the S.D., co-efficient of S.D., variance and co-efficient of variance of the following data :

Class :	0 – 30	30 – 60	60-90	90-120	120-150	150-180	180-210
Frequency :	9	17	43	82	81	44	24

311302

23242

3 Hours / 70 Marks Seat No. | | | | | | | | |

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(4) Figures to the right indicate full marks.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE : **10**

(a) Find the value of $\log\left(\frac{2}{3}\right) + \log\left(\frac{4}{5}\right) - \log\left(\frac{8}{15}\right)$.

(b) Without using calculator, find the value of cos (135°).

(c) If $f(x) = x^3 - \frac{1}{x^3}$, show that $f(x) + f\left(\frac{1}{x}\right) = 0$.

(d) State whether the function $f(x) = \frac{e^x + e^{-x}}{2}$ is even or odd.

(e) Find $\frac{dy}{dx}$ if $y = x^2e^x$.

(f) Find range & coefficient of range for the runs scored by cricket player in eight innings 45, 42, 39, 40, 48, 41, 45, 44.

(g) If mean is 34.5 & S.D. (σ) is 5, find C.V. (Coefficient of Variance).

2. Attempt any THREE : **12**

(a) If $P = \begin{bmatrix} 1 & 2 & -3 \\ 3 & -1 & 2 \\ -2 & 1 & 3 \end{bmatrix}$, $Q = \begin{bmatrix} 2 & 3 & 1 \\ 3 & 1 & 2 \\ 1 & 2 & 3 \end{bmatrix}$, then find matrix R such that $P + Q + R = 0$.

(b) Resolve into partial fraction $\frac{x^2 - 2x + 3}{(x + 2)(x^2 + 1)}$.

(c) Without using calculator, find the value of $\sin 150° + \cos 300° - \tan 315° + \sec^2 360°$.

(d) Find mean deviation from mean for the data :

17, 15, 18, 23, 25, 22, 11, 5

3. Attempt any THREE : **12**

(a) Prove that $\frac{\sin 4A + \sin 5A + \sin 6A}{\cos 4A + \cos 5A + \cos 6A} = \tan 5A$.

(b) Prove that $\sqrt{2 + \sqrt{2 + \cos 4\theta}} = 2 \cos \theta$.

(c) Show that $\tan^{-1}\left(\frac{1}{8}\right) + \tan^{-1}\left(\frac{1}{5}\right) = \tan^{-1}\left(\frac{1}{3}\right)$.

(d) If $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$, then find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$.

4. Attempt any THREE : **12**

(a) If $A = \begin{bmatrix} 2 & 1 \\ 0 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ 3 & -2 \end{bmatrix}$,

show that AB is singular or non-singular matrix.

(b) Find $\frac{dy}{dx}$ if $y = (\sin x)^x$.

(c) Find $\frac{dy}{dx}$ if $x^2 + y^2 = 4xy$.

(d) Find $\frac{dy}{dx}$ if $y = \tan^{-1}\left(\frac{a + x}{1 - ax}\right)$.

(e) A metal wire 36 cm long bent to form a rectangle. Find its dimensions when area is maximum.

5. Attempt any TWO : **12**

(a) (i) Find the equation of straight line passes through the points (–4, 6) & (8, –3).

(ii) Find the equation of line passing through (2, 5) & through the intersection of lines $x + y = 0$ & $2x - y = 9$.

(b) (i) Find the angle between the lines $x + 5y = 11$ & $5x - y = 11$.

(ii) Find the perpendicular distance of the point (–3, 4) from the line $4(x + 2) = 3(y - 4)$.

(c) (i) A beam is bent in the form of curve $y = 2 \sin x - \sin 2x$. Find the radius of curvature of beam at point $x = \frac{\pi}{2}$.

(ii) Find the equation of tangent to the curve $4x^2 + 9y^2 = 40$ at (1, 2).

6. Attempt any TWO : **12**

(a) Using matrix-inversion method, solve the following system of equations :

$x + y + z = 6$; $3x - y + 3z = 10$; $5x + 5y - 4z = 3$

(b) (i) Find mean of the following distribution :

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
No. of Students	5	8	15	16	6

(ii) An analysis of monthly wages paid to the workers in two firms A & B belonging to the same industry gives following data :

	Firm-A	**Firm-B**
Average monthly wages (in ₹)	186	175
Variance of distribution of wages (in ₹)	81	100

Which firm is more consistent ?

(c) Calculate mean and standard deviation and coefficient of variation of the following data :

C.I.	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	14	23	27	21	15

22103

11920

3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : **10**

(a) Find the value of x if $\log_3 (x + 6) = 2$.

(b) Find the area of triangle whose vertices are (–3, 1), (1, –3) and (2, 3).

(c) Without using calculator, find the value of cos (–765°).

(d) Find the length of the longest pole that can be placed in a room 12 m long 9 m broad and 8 m high.

(e) Find the volume of the sphere whose surface area is 616 sq. m.

(f) If mean is 82 and standard deviation is 7, find the coefficient of variance.

(g) Find range and coefficient of range for the data :

3, 7, 11, 2, 16, 17, 22, 20, 19

2. Attempt any THREE of the following : **12**

(a) If $A = \begin{bmatrix} -2 & 0 & 2 \\ 3 & 4 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 1 \\ 3 & 5 \\ 0 & 2 \end{bmatrix}$ whether AB is singular or non-singular matrix.

(b) Resolve into partial fraction :

$$\frac{2x + 3}{x^2 - 2x - 3}$$

(c) The voltages in an circuit are related by the following equations :

$V_1 + V_2 + V_3 = 9$

$V_1 - V_2 + V_3 = 3$

$V_1 + V_2 - V_3 = 1$

Find V_1, V_2, V_3 by using Cramer's Rule.

(d) Compute standard deviation for the following data :

1, 2, 3, 4, 5, 6, 7

3. Attempt any THREE of the following : **12**

(a) Simplify :

$$\frac{\cos^2 (180° - \theta)}{\sin (-\theta)} + \frac{\cos^2 (270° + \theta)}{\sin (180 + \theta)}$$

(b) Prove that :

$1 + \tan \theta \, . \tan 2\theta = \sec 2\theta$.

(c) Prove that :

$$\frac{\sin 4A + \sin 5A + \sin 6A}{\cos 4A + \cos 5A + \cos 6A} = \tan 5A.$$

(d) Prove that :

$$\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) = \frac{\pi}{4}.$$

4. Attempt any THREE of the following : **12**

(a) If $A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 0 & 2 \\ 4 & 5 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$ verify $(AB)^T = B^T A^T$.

(b) Resolve in to partial fraction :

$$\frac{3x - 2}{(x + 2)(x^2 + 4)}$$

(c) Without using calculator, prove that

$$\cos 20° \cdot \cos 40° \cdot \cos 60° \cdot \cos 80° = \frac{1}{16}$$

(d) Prove that :

$$\tan A \cdot \tan (60 - A) \cdot \tan (60 + A°) = \tan 3A$$

(e) If $\angle A$ and $\angle B$ are obtuse angles and $\sin A = \frac{12}{13}$, $\cos B = \frac{-4}{5}$,

find $\cos (A + B)$.

5. Attempt any TWO of the following : **12**

(a) Attempt the following :

(i) Find length of perpendicular from the point P (2, 5) on the line $2x + 3y - 6 = 0$.

(ii) Find the equation of line passing through (2, 3) and having slope 5 units.

(b) Attempt the following :

(i) Find the equation of the line passing through the point (2, 3) and perpendicular to the line $3x - 5y = 6$.

(ii) Find the acute angle between the lines $3x - y = 4$, $2x + y = 3$.

P.T.O.

(c) Attempt the following :

(i) A cylinder has hemispherical ends having radius 14 cm and height 50 cm. Find the total surface area.

(ii) A solid right circular cone of radius 2 m and height 27 m is melted and recasted into a sphere. Find the volume and surface area of the sphere.

6. Attempt any TWO of the following : **12**

(a) Find the mean, standard deviation and coefficient of variance of the following data :

Class – Interval	0-10	10-20	20-30	30-40	40-50
Frequency	14	23	27	21	15

(b) Attempt the following :

(i) From the following data, calculate range and coefficient of range :

Marks	10-19	20-29	30-39	40-49	50-59	60-69
No. of Students	6	10	16	14	8	4

(ii) The two set of observations are given below :

Set I	**Set II**
$\bar{x} = 82.5$	$\bar{x} = 48.75$
$\sigma = 7.3$	$\sigma = 8.35$

Which of two sets is more consistent ?

(c) Solve the following equations by matrix inversion method :

$x + y + z = 3$

$3x - 2y + 3z = 4$

$5x + 5y + z = 11$

22103

12223

3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Answer each next main Question on a new page.

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(4) Figures to the right indicate full marks.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : **10**

(a) Find x, if $\log_3 (x + 5) = 4$.

(b) Find the value of $\begin{vmatrix} 3 & -5 & -1 \\ 1 & 3 & 5 \\ -5 & 1 & 3 \end{vmatrix}$.

(c) Without using calculator find the value of cos(75°).

(d) The length of one side of the rectangle is twice the length of its adjacent side. If the perimeter of rectangle is 60 cm, find the area of rectangle.

(e) The length, breadth & height of a cuboid are 26 cm, 20 cm & 12 cm respectively. Find the total surface area of cuboid.

(f) If mean is 34.5 & standard deviation is 5. Find the coefficient of variance.

(g) Find the range & coefficient of range for the data : 45, 42, 39, 40, 48, 41, 45, 44.

2. Attempt any THREE of the following : **12**

(a) If $A = \begin{bmatrix} 2 & 1 \\ 0 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ 3 & -2 \end{bmatrix}$ whether AB is singular or non-singular matrix.

(b) Resolve into partial fractions : $\frac{2x + 3}{x^2 - 2x - 3}$

(c) Using Cramer's rule solve : $x + y - z = 0$, $2x + y + 3z = 9$, $x - y + z = 2$

(d) Calculate the mean deviation about mean of the given data :

17, 15, 18, 23, 25, 22, 11, 5

3. Attempt any THREE of the following : **12**

(a) Without using calculator, find the value of

$\sin 150° + \cos 300° - \tan 315° + \sec^2 3660°$

(b) Prove that $\sqrt{2 + \sqrt{2 + 2\cos 4\theta}} = 2\cos\theta$.

(c) Show that $\frac{\sin 7x + \sin x}{\cos 5x - \cos 3x} = \sin 2x - \cos 2x.\cot x$.

(d) Show that : $\cos^{-1}\left(\frac{4}{5}\right) - \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{63}{65}\right)$.

4. Attempt any THREE of the following : **12**

(a) Find x, y, z if $\left\{\begin{bmatrix}1 & 3 & 2\\ 2 & 0 & 1\\ 3 & 1 & 2\end{bmatrix} + 2\begin{bmatrix}3 & 0 & 2\\ 1 & 4 & 5\\ 2 & 1 & 0\end{bmatrix}\right\}\begin{bmatrix}1\\ 2\\ 3\end{bmatrix} = \begin{bmatrix}x\\ y\\ z\end{bmatrix}$.

(b) Resolve into partial fractions $\frac{x^2 - 2x + 3}{(x + 2)(x^2 + 1)}$.

(c) Show that $\sin(10°) \sin(30°) \sin(50°) \sin(70°) = \frac{1}{16}$.

(d) If $\tan\left(\frac{\theta}{2}\right) = \frac{2}{3}$, find the value of $2 \sin\theta + 3 \cos\theta$.

(e) If α & β both are obtuse angles & $\sin\alpha = \frac{5}{13}$, $\cos\beta = \frac{-4}{5}$, find $\cos(\alpha + \beta)$.

5. Attempt any TWO of the following : **12**

(a) (i) Find length of the perpendicular from the point (5, 6) on the line $2x + y + 6 = 0$. **3**

(ii) Find the equation of line passing through the point (–3, 2) & having slope $\frac{5}{2}$. **3**

(b) (i) Find the equation of line passing through the point (3, 4) & perpendicular to the line $3x + 2y + 5 = 0$ **3**

(ii) Find the acute angle between the lines $3x - y = 4$, $2x + y = 3$. **3**

(c) (i) Find the capacity of a cylindrical water tank whose radius is 2.1 m & length is 5 m. **3**

(ii) The volume of cube is 1000 cm^3. Find its total surface area. **3**

6. Attempt any TWO of the following : **12**

(a) Calculate the mean, standard deviation & coefficient of variance of the following data :

Class interval	70-80	80-90	90-100	100-110	110-120	120-130	130-140	140-150
Frequency	6	7	12	19	21	18	11	6

(b) (i) Find the range & coefficient of range for the following data : **3**

Marks	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No. of Students	10	15	16	20	21	22	9	8

(ii) The following data pertain to two workers doing the same job in a factory. **3**

	Worker A	**Worker B**
Mean time of completing the job (in minutes)	40	42
Standard deviation (minutes)	8	6

Who is more consistent ?

(c) Solve the following equations by matrix inversion method :

$2x + y = 3$, $2y + 3z = 4$, $2x + 2z = 8$

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3 Hours / 70 Marks Seat No. | | | | | | | | |

Instructions : (1) All Questions are *compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : **10**

(a) Find the value of x if, $\log_5 (x^2 - 5x + 11) = 1$

(b) Find the value of sin (15°) using compound angles.

(c) Find the intercepts of the line $2x + 3y = 6$ on both the axes.

(d) State whether the function is even or odd if, $f(x) = x^3 + 4x + \sin x$.

(e) At which point on the curve $y = 3x - x^2$ the slope of the tangent is –5 ?

(f) Divide 100 into two parts such that their product is maximum.

(g) If mean is 34.5 and standard deviation is 5, find the co-efficient of variance.

2. Attempt any THREE of the following : **12**

(a) If $A = \begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}$, then

Find the matrix 'X' such that

$2X + 3A - 4B = I$, where I is identity matrix of order 2.

(b) If $A = \begin{bmatrix} -2 & 0 & 2 \\ 3 & 4 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 1 \\ 3 & 5 \\ 0 & 2 \end{bmatrix}$, whether AB is singular or non-singular matrix ?

(c) Resolve into partial fraction $\frac{3x-2}{(x+2)(x^2+4)}$.

(d) If A and B are obtuse angle and $\sin A = \frac{5}{13}$ and $\cos B = \frac{-4}{5}$, then find

$\sin (A + B)$.

3. Attempt any THREE of the following : **12**

(a) Prove that, $\frac{\sin 3A - \sin A}{\cos 3A + \cos A} = \tan A$

(b) Prove that $\sin^{-1}\left(\frac{3}{5}\right) - \sin^{-1}\left(\frac{8}{17}\right) = \cos^{-1}\left(\frac{84}{85}\right)$.

(c) Find the equation of straight line passing through the point of intersection of lines $4x + 3y = 8$ and $x + y = 1$; and parallel to the line $5x - 7y = 3$.

(d) Find $\frac{dy}{dx}$, if $x^3 + xy^2 = y^3 + yx^2$.

4. Attempt any THREE of the following : **12**

(a) If $x = a(\theta + \sin\theta)$ & $y = a(1 - \cos\theta)$, find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{2}$.

(b) If $y = (x)^{\sin x} + (\tan x)^x$, find $\frac{dy}{dx}$.

(c) Find the range and co-efficient of range for the following data :

Class Interval	10 – 19	20 – 29	30 – 39	40 – 49	50 – 59
Frequency	15	25	13	17	10

(d) Calculate the mean deviation about mean of the following data :

17, 15, 18, 23, 25, 22, 11, 5

(e) The following data pertains to two workers doing the same job in a factory :

Details	**Worker A**	**Worker B**
Mean time of completing job	40	42
Standard deviation	8	6

Who is more consistent worker ?

5. Attempt any TWO of the following : **12**

(a) Solve the following system of equations by matrix inversion method :

$x + y + z = 3$, $3x - 2y + 3z = 4$, $5x + 5y + z = 11$

(b) (i) If $\tan\left(\frac{A}{2}\right) = \frac{1}{\sqrt{3}}$, find the value of cos A.

(ii) Evaluate without using calculator

$$\frac{\tan 85° - \tan 40°}{1 + \tan 85° \cdot \tan 40°}$$

(c) (i) Find the distance between the parallel lines $3x + 2y = 5$ and $3x + 2y = 6$.

(ii) Find the acute angle between the line, $3x = y - 4$ and $2x + y + 3 = 0$.

6. Attempt any TWO of the following : **12**

(a) A manufacturer can sell 'x' items at a price of ₹ $(330 - x)$ each. The cost of producing x items in ₹ $(x^2 + 10x + 12)$. Determine the number of items to be sold so that the manufacturer can make the maximum profit.

(b) A beam is bent in the form of curve $y = 2 \sin x - \sin 2x$. Find radius of curvature of the beam at $x = \frac{\pi}{2}$.

(c) Find mean, standard deviation and co-efficient of variance of the following data :

Class Interval	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	14	23	27	21	15
