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.

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(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 :

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