

17104

11920

3 Hours / 100 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) Assume suitable data, if necessary.
 - (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. Solve any TEN of the following:

20

a) Find the value of x if $\begin{vmatrix} 4 & 3 & 9 \\ 3 & 2 & 7 \\ 1 & 4 & x \end{vmatrix} = 0$

b) Find X if, $\begin{bmatrix} 4 & 5 \\ -3 & 6 \end{bmatrix} + X = \begin{bmatrix} 10 & -1 \\ 0 & -5 \end{bmatrix}$

c) If $A = \begin{bmatrix} 4 & 2 \\ 8 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 6 \\ -4 & -12 \end{bmatrix}$ show that AB is null matrix.

d) If $A = \begin{bmatrix} 5 & 4 \\ 4 & 3 \end{bmatrix}$, $B = \begin{bmatrix} -3 & 4 \\ 4 & -5 \end{bmatrix}$ verify that $AB = BA$.

e) Resolve into partial fractions $\frac{1}{x(x-1)}$

f) Prove that $\cos 2A = 2\cos^2 A - 1$

P.T.O.

- g) Prove that $\sin\left(\theta + \frac{\pi}{6}\right) - \sin\left(\theta - \frac{\pi}{6}\right) = \cos \theta$
- h) Without calculator find the value of $\sin 15^\circ$.
- i) If $\sin A = \frac{1}{2}$, find $\sin 3A$
- j) Show that $3x - 2y + 6 = 0$ and $2x + 3y - 1 = 0$ are perpendicular lines.
- k) Find equation of line passing through (4, 5) and parallel to $2x - 3y - 5 = 0$.
- l) Find the range and co-efficient of range of following distribution
3, 6, 10, 1, 15, 16, 21, 19, 18

2. Solve any FOUR of the following:

16

- a) Solve by using Cramer's rule :

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

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

- c) If $A = \begin{bmatrix} 2 & -3 \\ 1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$

$$\text{verify that } (AB)^T = B^T A^T$$

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

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

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

3. Solve any FOUR of the following:

16

- a) Find the inverse of the matrix using adjoint method

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & -1 \\ 1 & -1 & 0 \end{bmatrix}$$

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

- c) Resolve into partial fraction
- $\frac{(\sin \theta + 1)}{(\sin \theta + 2)(\sin \theta + 3)}$

- d) Prove that
- $\sin 3A = 3 \sin A - 4 \sin^3 A$

- e) Show that
- $\frac{\sin A + \sin 2A + \sin 3A + \sin 4A}{\cos A + \cos 2A + \cos 3A + \cos 4A} = \tan \left(\frac{5A}{2} \right)$

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

4. Solve any FOUR of the following:

16

- a) Prove that
- $\frac{1 + \sec 2\theta}{\tan 2\theta} = \cot \theta$

- b) Prove that
- $\sqrt{2 + \sqrt{2 + \sqrt{2 + 2 \cos 8A}}} = 2 \cos A$

- c) Without using calculator find the value of
- $\sin 150^\circ - \tan 315^\circ + \cos 300^\circ + \sec 3660^\circ$

- d) If
- $A + B = \frac{\pi}{4}$
- show that
- $(1 + \tan A)(1 + \tan B) = 2$

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

- f) Prove that
- $\cos^{-1} \left(\frac{4}{5} \right) + \cos^{-1} \left(\frac{12}{13} \right) = \cos^{-1} \left(\frac{33}{65} \right)$

5. Solve any FOUR of the following:

16

- a) Prove that $\tan^{-1}(x) + \tan^{-1}(y) = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$
If $x > 0$, $y > 0$, $xy < 1$
- b) Prove that $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \frac{3}{16}$
- c) Prove that $\cos C + \cos D = 2 \cos\left(\frac{C+D}{2}\right) \cdot \cos\left(\frac{C-D}{2}\right)$.
- d) Find the angle between two lines $2x + 3y + 5 = 0$
and $x - 2y - 4 = 0$.
- e) Prove that the distance between two parallel line $ax + by + c_1 = 0$
and $ax + by + c_2 = 0$ is $\left| \frac{C_2 - C_1}{\sqrt{a^2 + b^2}} \right|$
- f) Find the equation of line passing through the point of intersection
of lines $x + y = 0$, $2x - y = 9$ and through the point $(2, 5)$.

6. Solve any FOUR of the following:

16

- a) If m_1 and m_2 are slopes of any two lines L_1 and L_2 then prove
that angle between two lines L_1 and L_2 is $\theta = \tan^{-1} \left| \frac{m_1 - m_2}{1 + m_1 m_2} \right|$
- b) Find the equation of straight line passing through $(4, 5)$ and
perpendicular to the line $7x + 5y = 2019$.
- c) Find the mean deviation from the mean of the following:

Class interval	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	6	10	18	9	3

- d) Find the standard deviation of the following distribution.

Marks	0-10	10-20	20-30	30-40	40-50
No. of Students	3	5	8	3	1

- e) Find variance and co-efficient of variance for the following data.

Class interval	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	3	5	9	15	20	16	10	2

- f) 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 set is more constant ?
