



17105

15162

3 Hours / 100 Marks

Seat No.

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- 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

20

1. Attempt any ten :

a) Evaluate $\begin{vmatrix} -2 & 1 & 3 \\ 7 & -5 & 8 \\ 1 & 0 & 4 \end{vmatrix}$.

b) Solve: $\begin{vmatrix} 1 & -2 & 4 \\ 1 & x & x^2 \\ 4 & 6 & 9 \end{vmatrix} = \begin{vmatrix} 3 & 6 \\ -2 & -4 \end{vmatrix}$.

c) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 7 \\ 1 & 9 \end{bmatrix}$ find $A + B$ and $A - B$.

d) If $A = \begin{bmatrix} 2 & 1 \\ 0 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ 3 & -2 \end{bmatrix}$ find AB .

e) If $A = \begin{bmatrix} 6 & 5 \\ 2 & 1 \end{bmatrix}$ find $\text{adj } A$.

f) Resolve into partial fraction $\frac{1}{x^2 + 5x + 6}$.

g) Prove that $\sin 2A = 2 \sin A \cos A$.

h) Define compound angle.

i) Find the principle values of $\tan^{-1}(\sqrt{3})$.

j) Find $\tan 75^\circ$.

k) Find $\sin 32$, if $\sin \alpha = 0.4$.

l) If the straight line $3y + 4px + 8 = 0$ and $3px - 9y + 10 = 0$ are perpendicular to each other, find the value of P .

P.T.O.



2. Attempt any four:

16

a) Solve by determinant method

$$x + y + z - 6 = 0, 2x + y - 2z + 2 = 0, x + y - 3z + 6 = 0.$$

b) Find x, if $x + z = 4, y + z = 2, x + y = 0$ by using Cramer's Rule.c) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix}, B = \begin{bmatrix} 1 & 3 \\ 4 & 6 \end{bmatrix}$ find $2A + 3B - 4I$ where I is the unit matrix of order 2.

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) If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ find the value of $A^2 - 5A + 7I$ where I is unit matrix of order 2.f) Find the adjoint of matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & 5 \\ 1 & 5 & 12 \end{bmatrix}$.

3. Attempt any four:

16

a) If $A = \begin{bmatrix} 1 & -3 \\ 2 & -1 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 & 1 \\ 2 & -1 & 3 \end{bmatrix}$ verify that $(AB)' = B'A'$.b) Find the inverse of the matrix of the equations $2x + 5y = 9; x + 3y = 5$ and hence solve the equations.c) Resolve into partial fraction $\frac{x+4}{x(x+1)(x+2)}$.d) Resolve into partial fraction $\frac{x-5}{x^3+x^2-5x}$.e) Resolve into partial fraction $\frac{x^2+1}{(x^2+2)(x^2+3)}$.f) Resolve into partial fraction $\frac{3x^2+17x+14}{x^3-8}$.

**4. Attempt any four:**

16

- a) Without using calculator find the value of $\cos 570^\circ \sin 510^\circ + \sin(-330^\circ) \cos(-390^\circ)$.
- b) Prove that $\sin\left(\frac{\pi}{3} + A\right) \cos\left(\frac{\pi}{3} + B\right) - \cos\left(\frac{\pi}{3} + A\right) \sin\left(\frac{\pi}{3} + B\right) = \sin(A - B)$.
- c) Prove that $\tan 70^\circ - \tan 50^\circ - \tan 20^\circ = \tan 70^\circ \tan 50^\circ \tan 20^\circ$.
- d) Prove that $\cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{33}{65}\right)$.
- e) If $x > 0$ $y > 0$ $1 - xy > 0$ then prove that $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left[\frac{x+y}{1-xy}\right]$.
- f) Prove that $\frac{\sin 8\theta + \sin 2\theta}{\cos 8\theta + \cos 2\theta} = \tan 5\theta$.

5. Attempt any four:

16

- a) Prove that $\frac{\sin 5A + 2\sin 7A + \sin 9A}{\cos 3A + 2\cos 5A + \cos 7A} = \sin 2A + \cos 2A \tan 5A$.
- b) Prove that $\frac{\cos A}{1 - \sin A} = \frac{1 + \tan \frac{A}{2}}{1 - \tan \frac{A}{2}}$.
- c) In a triangle ABC, If $A + B + C = \pi$ then prove that $\tan A + \tan B + \tan C = \tan A \tan B \tan C$.
- d) Prove that $\tan^{-1}1 + \tan^{-1}2 + \tan^{-1}3 = 0$.
- e) Prove that $\frac{\sec 8A - 1}{\sec 4A - 1} = \frac{\tan 8A}{\tan 2A}$.
- f) Prove that $\cos 15^\circ \cos 30^\circ \cos 60^\circ \cos 75^\circ = \frac{\sqrt{3}}{16}$.

6. Attempt any four:

16

- a) If m_1 and m_2 are the slopes of two lines then prove that $\tan \theta = \left| \frac{m_1 - m_2}{1 + m_1 m_2} \right|$
- b) Prove that the distance between two parallel lines $ax + by + c = 0$ and $ax + by + c' = 0$ is $d = \left| \frac{c' - c}{\sqrt{A^2 + B^2}} \right|$.
- c) Find the equation of the line joining the point $(2, -3)$ with the point of intersection of $4x + 3y + 2 = 0$ and $6x + 5y + 6 = 0$.
- d) Find the length of perpendicular on the line $\sqrt{3}x - y - 14 = 0$ from the origin.
- e) Find the angle between the lines $y = 5x + 6$ and $y = x$.
- f) Find the equation of the straight line passing through the point of intersection of the lines $4x + 3y = 8$ and $x + y = 1$ and perpendicularly to the line $7x + 5y = 9$.