

17105

11819

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) 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) Solve $\begin{vmatrix} x & 2 \\ 8 & 4 \end{vmatrix} = \begin{vmatrix} 1 & 1 \\ 2 & 2 \end{vmatrix}$

b) Find x , if $\begin{vmatrix} 3 & 4 & 3 \\ 5 & x & x \\ 1 & 3 & 2 \end{vmatrix} = 0$

c) If $A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 1 \\ 0 & -2 \end{bmatrix}$ find $|A + B|$

d) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 \\ 4 & 6 \end{bmatrix}$ find $3A - 2B$.

e) Resolve into partial fractions: $\frac{1}{x^2 - x}$

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

P.T.O.

- g) Find $\sin \alpha$ if $\tan \left(\frac{\alpha}{2}\right) = \frac{1}{\sqrt{3}}$
- h) Show that $\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$
- i) Define
- (i) Compound angle
 - (ii) Allied angle
- j) If $2 \sin 40 \cos 10 = \sin A + \sin B$ find A, B.
- k) Evaluate $\tan \left[2 \tan^{-1} \left(\frac{1}{5} \right) \right]$
- l) Show that $\frac{\sin 19 + \cos 11}{\cos 19 - \sin 11} = \sqrt{3}$
- m) Find the acute angle between the lines $y = 5x + 6$ and $y = x$
- n) Find the slope and y intercept of the line $3x - 4y + 5 = 0$

2. Solve any FOUR of the following:

16

- a) Find y , using Cramers rule,
 $x + y + z = 6$, $2x + y - 2z = -2$, $x + y - 3z = -6$
- b) If $A = \begin{bmatrix} 2 & 4 \\ 1 & 1 \end{bmatrix}$ show that A satisfies the matrix equation
 $A^2 - 3A - 2I = 0$, where I is the identity matrix.
- c) If $A = \begin{bmatrix} -2 & 0 & 1 \\ 1 & 2 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 1 \\ 2 & 3 \\ 1 & 1 \end{bmatrix}$ show that the matrix
 AB is a non-singular.
- d) Resolve into partial fraction: $\frac{2x + 3}{x^2(x - 1)}$
- e) If $A = \begin{bmatrix} 2 & -3 \\ 1 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$ verify $(AB)^T = B^T A^T$

f) Solve by determinant method.

$$\frac{2}{x-1} + \frac{3}{y-3} = 5, \quad \frac{3}{x-1} - \frac{4}{y-3} = -1$$

3. Solve any **FOUR** of the following:

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a) Resolve into partial fractions: $\frac{x+3}{(x^2-1)(x+5)}$

b) Resolve into partial fractions: $\frac{x-5}{x^3+x^2-6x}$

c) Resolve into partial fractions: $\frac{x^4}{x^3+1}$

d) Find x and y satisfying the matrix equation

$$\begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix} \begin{bmatrix} x & y & 3 \\ 3 & -1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 0 & 7 \\ 9 & 4 & 13 \end{bmatrix}$$

e) Using matrix inversion method, solve the equations

$$5x + y = 13, \quad 3x + y = 5$$

f) If $A = \begin{bmatrix} 1 & -2 \\ 3 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 0 \\ -1 & 2 \end{bmatrix}$, $C = \begin{bmatrix} -1 & 0 \\ 0 & 3 \end{bmatrix}$

verify that $(AB)C = A(BC)$

4. Solve any **FOUR** of the following:

16

a) In any triangle ABC Prove that:

$$\tan 3A - \tan 2A - \tan A = \tan 3A \tan 2A \tan A$$

b) Show that $\cos(A+B) = \cos A \cos B - \sin A \sin B$.

c) Show that $\frac{\sin A + 2 \sin 2A + \sin 3A}{\cos A + 2 \cos 2A + \cos 3A} = \tan 2A$

d) Show that $\cos 20^\circ \cdot \cos 40^\circ \cdot \cos 60^\circ \cdot \cos 80^\circ = \frac{1}{16}$

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

f) If x and y are positive then show that

$$\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right) \text{ if } 1-xy > 0$$

5. Solve any FOUR of the following:

16

a) Show that in a triangle

$$\tan 75^\circ + \tan 65^\circ + \tan 40^\circ = \tan 75^\circ \tan 65^\circ \tan 40^\circ$$

b) If $\tan\left(\frac{\theta}{2}\right) = \frac{4}{5}$, find the value of $3 \tan \theta - 7 \sin \theta$.c) Show that $\cos 3A = 4 \cos^3 A - 3 \cos A$.d) Show that $\tan^{-1}\left(\frac{3}{4}\right) + \tan^{-1}\left(\frac{3}{5}\right) - \tan^{-1}\left(\frac{8}{19}\right) = \frac{\pi}{4}$ e) Show that $\frac{\sin 7x + \sin x}{\cos 5x - \cos 3x} = \sin 2x - \cos 2x \cot 2x$ f) Show that $\sin(A+B) \sin(A-B) = \sin^2 A - \sin^2 B$ 6. Solve any FOUR of the following:

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a) Find the acute angle between the lines

$$3x - y = 4, \quad 2x + y = 3$$

b) If m_1 and m_2 are slopes of the two lines, then show that the

$$\text{acute angle between two lines is } \theta = \tan^{-1} \left| \frac{m_1 - m_2}{1 + m_1 m_2} \right|$$

c) Show that the lines $2x + 3y - 1 = 0$, $3x - 2y + 6 = 0$ are perpendicular.d) Find the equation of a line passing the point (2, 5) and the point of intersection of lines $x + y = 0$ and $2x - y = 9$

e) Find perpendicular distance between the parallel lines

$$5x - 12y + 1 = 0 \text{ and } 10x = 24y + 1$$

f) Find the equation of the line passing through the point of intersection of the line $2x + 3y = 13$, $5x - y = 7$ and perpendicular to $3x - y + 7 = 0$
