



17104

21314

3 Hours/100 Marks

Seat No.

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- Instructions :** (1) **All** questions are **compulsory**.
(2) Figures to the **right** indicate **full** marks.
(3) **Use** of Non-programmable Electronic Pocket Calculator is **permissible**.
(4) Mobile Phone, Pager and **any** other Electronic Communication devices are **not permissible** in Examination Hall.

MARKS

1. Attempt **any ten** :

20

a) Solve to find value of x

$$\begin{vmatrix} 2 & 3 & 1 \\ 6 & x & 2 \\ 4 & x & -2 \end{vmatrix} = 0.$$

b) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 \\ 4 & 6 \end{bmatrix}$ find $3A - 2B$.c) If $A = \begin{bmatrix} 1 & -5 \\ 6 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ find the matrix $AB - 2I$ where I is 2×2 identity matrix.d) $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$ verify that $(A + B)^T = A^T + B^T$.e) Resolve $\frac{1}{1-x^2}$ into partial fractions.f) Without using calculator find the value of $\sin(-330^\circ)$.

g) Write the following formulae :

i) $\sin(A + B)$ andii) $\cos(A - B)$.

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- h) If $\sin A = 1/2$ find $\sin 3A$.
- i) Evaluate $2 \cos 75^\circ \cdot \cos 15^\circ$ without using calculator.
- j) Prove that $\cos^{-1}(-x) = \pi - \cos^{-1}x$.
- k) Find the slope of a line passing through pts. $(-1, -2)$ and $(-3, 8)$.
- l) Find the range and the coefficient of range for the following data :
120, 100, 130, 50, 150.

2. Attempt **any four** :

16

- a) The voltages in an electric circuit are related by following eqns.
 $V_1 + V_2 + V_3 = 9$; $V_1 - V_2 + V_3 = 3$, $V_1 + V_2 - V_3 = 1$. Find V_1 , V_2 and V_3 .
- b) If $A = \begin{bmatrix} x & 2 & -5 \\ 3 & 1 & 2y \end{bmatrix}$ and $B = \begin{bmatrix} 2y+5 & 6 & -15 \\ 9 & 3 & -6 \end{bmatrix}$ and if $3A = B$, find x , y .
- c) If $A = \begin{bmatrix} 0 & 1 & -1 \\ 3 & -2 & 3 \\ 2 & -2 & 3 \end{bmatrix}$ show that $A^2 = I$.
- d) Using matrix inversion method, solve the equations.
 $5x + y = 13$, $3x + 2y = 5$.
- e) Resolve into partial fractions

$$\frac{x^2 + 4x + 1}{(x-1)(x+1)(x+3)}$$

- f) Resolve into partial fractions $\frac{x^2 + 23x}{(x+3)(x^2+1)}$.

3. Attempt **any four** :

16

- a) If $A = \begin{bmatrix} 2 & 4 & 4 \\ 4 & 2 & 4 \\ 4 & 4 & 2 \end{bmatrix}$ show that $A^2 - 8A$ is a scalar matrix.



MARKS

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

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

d) Prove that $\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \cdot \tan B}$.

e) Prove that $\frac{\sin A + 2 \sin 2A + \sin 3A}{\cos A + 2 \cos 2A + \cos 3A} = \tan 2A$.

f) Prove that $\tan^{-1}\left(\frac{1}{7}\right) + \tan^{-1}\left(\frac{1}{13}\right) = \cot^{-1}\left(\frac{9}{2}\right)$.

4. Attempt **any four** :

16

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

b) Prove that $\cos 3\theta = 4 \cos^3 \theta - 3 \cos \theta$.

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

d) Prove that $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \frac{3}{16}$.

e) Prove that $\cos^{-1}\left(\frac{4}{5}\right) + \tan^{-1}\left(\frac{3}{5}\right) = \tan^{-1}\left(\frac{27}{11}\right)$.

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

5. Attempt **any four** :

16

a) Prove that $\sin(A + B) \sin(A - B) = \sin^2 A - \sin^2 B$.

b) Prove that $\sin C + \sin D = 2 \sin\left(\frac{C + D}{2}\right) \cos\left(\frac{C - D}{2}\right)$.



c) Prove that $\tan^{-1}(x) + \tan^{-1}(y) = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$ if $xy < 1$.

d) Prove that if θ is the acute angle between the lines with slopes m_1 and m_2

then $\tan\theta = \left| \frac{m_1 - m_2}{1 + m_1 m_2} \right|$.

e) Find the equation of line which passes through the point of intersection of lines $2x + 3y = 13$, $5x - y = 7$ and perpendicular to line $2x - 5y + 7 = 0$.

f) Find the length of the perpendicular from $(3, 2)$ on the line $4x - 6y - 5 = 0$.

6. Attempt any four :

16

a) Find perpendicular distance between the parallel lines $5x - 12y + 1 = 0$ and $10x - 24y = 1$.

b) Find equation of straight line passing through the pts. $(-4, 6)$ and $(8, -3)$.

c) Find mean deviation from mean for following distribution.

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
No. of students	5	8	15	16	6

d) Find the S.D. of following data :

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

e) The two sets of observation are given below :

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

Which of the two sets is more consistent ?

f) Find variance and coefficient of variance of the following data :

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