17104

15162

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. Attempt **any ten** of the following : **(2×10=20)**

a) Find x if $\begin{vmatrix} 1 & x & x^2 \\ 1 & 2 & 4 \\ 1 & 3 & 9 \end{vmatrix} = 0$.

b) Find the value if a and b if $\begin{bmatrix} a-4b & 5 \\ 6 & -a+b \end{bmatrix} = \begin{bmatrix} 11 & 5 \\ 6 & -5 \end{bmatrix}$.

c) If $A = \begin{bmatrix} 3 & 2 \\ 1 & -1 \\ 0 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & -1 \\ 3 & 2 \\ 4 & -2 \end{bmatrix}$ verify that $A + B = B + A$.

d) If $A = \begin{bmatrix} 7 & 0 & 2 \\ 1 & 2 & 6 \\ 4 & 5 & 3 \end{bmatrix}$, find whether matrix A is singular or non-singular.

e) Resolve into Partial fraction $1 + \frac{1}{x^2 - 1}$.

f) Find the value of

$\sin^2 60° + \tan^2 45° - \text{cosec}^2 30°$.

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

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h) If $\tan A = \frac{1}{2}$, $\tan B = \frac{1}{3}$, find $\tan (A + B)$.

i) Evaluate without using calculator $\frac{\tan 32° + \tan 88°}{1 - \tan 32° \cdot \tan 88°}$.

j) Find the principal value of $\tan^{-1}\left(\sqrt{3}\right)$.

k) Find the angle between the lines $3x + 2y = 6$ and $2x - 3y = 5$.

l) Find the range of the following data :
800, 725, 750, 900, 925, 910, 1000, 790, 870, 920.

2. Attempt **any four** of the following : **(4×4=16)**

a) Solve by Cramer's rule :
$x + y = 3$, $y + z = 5$, $z + x = 4$.

b) If $A = \begin{bmatrix} 2 & -3 \\ 1 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$, verify that $(AB)^T = B^T \cdot A^T$, A is 2×2, B is 2×3.

c) Find inverse of the matrix by using adjoint method $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$.

d) If $\left\{3\begin{bmatrix} 3 & 1 \\ 4 & 0 \\ 3 & -3 \end{bmatrix} - 2\begin{bmatrix} 0 & 2 \\ -2 & 3 \\ -5 & 4 \end{bmatrix}\right\}\begin{bmatrix} -1 \\ 2 \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ then find x, y, z.

e) Resolve into partial fraction : $\frac{x - 5}{x^3 + x^2 - 6x}$.

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

3. Attempt **any four** of the following : **(4×4=16)**

a) Solve the equation by inverse matrix method $3x + y + 2z = 3$, $2x - 3y - z = -3$, $x + 2y + z = 4$.

b) Resolve into partial fraction :
$\frac{3x - 2}{(x + 2)(x^2 + 4)}$.

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

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d) Given $\tan(A+B)=\frac{3}{4}$, $\tan(A-B)=\frac{77}{36}$, find tan2A.

e) If $A+B=\frac{\pi}{4}$, show that $(1+\tan A)(1+\tan B)=2$.

f) Show that :

$$\tan^{-1}\left(\frac{1}{2}\right)+\tan^{-1}\left(\frac{1}{5}\right)+\tan^{-1}\left(\frac{1}{8}\right)=\frac{\pi}{4}.$$

4. Attempt **any four** of the following : **(4×4=16)**

a) Prove that :

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

b) Without using calculator, prove that :

$\sin 420^\circ\times\cos 390^\circ+\cos(-300^\circ)\times\sin(-330^\circ)=1.$

c) Prove that :

$$\tan 3A=\frac{3\tan A-\tan^3 A}{1-3\tan^2 A}.$$

d) Prove that :

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

e) Prove that :

$$\frac{\sin 4A+\sin 5A+\sin 6A}{\cos 4A+\cos 5A+\cos 6A}=\tan 5A$$

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. Attempt **any four** of the following : **(4×4=16)**

a) Without using calculator, prove that :

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

b) Prove that :

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

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c) Prove that :

$$\tan^{-1}(x)+\tan^{-1}(y)=\tan^{-1}\left[\frac{x+y}{1-xy}\right],\ x>0,\ y>0 \text{ and } xy<1.$$

d) Find the distance between the lines $3x + 2y = 5$ and $6x + 4y = 6$.

e) Prove that the length of perpendicular on the line $Ax + By + C = 0$ from the point (x_1, y_1) is

$$P=\left|\frac{Ax_1+By_1+C}{\sqrt{A^2+B^2}}\right|.$$

f) Find the equation of the line passing through the point of intersection of lines $x + y = 0$ and $2x - y = 9$ and point (4, 5).

6. Attempt **any four** of the following : **(4×4=16)**

a) If m_1 and m_2 are the slope of the two lines, then prove that angle between two lines is

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

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

c) From the following data, calculate range and co-efficient of range :

Marks	10 – 19	20 – 29	30 – 39	40 – 49	50 – 59	60 – 69
No. of Student	6	10	16	14	8	4

d) Find the mean deviation from median of the following distribution :

Weight (in gms)	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40	40 – 45
No. of items	7	12	16	25	19	15	06

e) In two factories A and B, engaged in the same area of the industry, the average weekly wages (in Rs.) and the S.D. are as below :

Factory	**Average wages**	**S.D.**
A	34.5	5.0
B	28.5	4.5

which factory A or B has greater variability in individual wages ?

f) Calculate the mean and standard deviation of the following frequency distribution :

Class Interval	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	14	23	27	21	15