17104

## 21415

3 Hours/100 Marks
Seat No. $\square$
Instructions: (1) Allquestions are compulsory.
(2) Answereach 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

1. Attemptany ten of the following : 20
a) Find $x$ if $\left|\begin{array}{crr}4 & 3 & 9 \\ 3 & -2 & 7 \\ 11 & 4 & x\end{array}\right|=0$.
b) Prove that the matrix $\left[\begin{array}{ll}1 & 4 \\ 6 & 9\end{array}\right]$, is a nonsingular matrix.
c) If $A=\left[\begin{array}{rrr}3 & 4 & -2 \\ 2 & 1 & 0\end{array}\right]$, $B=\left[\begin{array}{rr}2 & -1 \\ 3 & 4 \\ 0 & 2\end{array}\right]$. Find $A B$.
d) Resolve into partial fractions $\frac{1}{x^{3}-x}$.
e) Define compound angle.
f) Prove that $\sin (\pi / 2+\theta)=\cos \theta$.
g) Express : $4 \cos 30^{\circ} \cdot \sin 20^{\circ}$ as the sum or difference of trigonometric ratios.
h) Find the principal value of, $\cos \left(\pi / 2-\sin ^{-1} \frac{1}{2}\right)$.
P.T.O.

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Marks
i) Show that the lines $5 x+6 y-1=0$ and $6 x-5 y+3=0$ are perpendicular lines.
j) Find equation of straight line passing through $(4,-5)$ having slope $\frac{-2}{3}$.
k) Find range and coefficient of range of the following distribution:
xi: $\begin{array}{lllll}10 & 20 & 30 & 40 & 50\end{array}$
fi: $\begin{array}{lllll}7 & 5 & 3 & 2 & 1\end{array}$
I) If mean is 82.5 , standard deviation is 7.2 , find coefficient of variance.
2. Attempt any four of the following:
a) Solve the following equations by using, Crammer's rule :

$$
x+y=4-z, y+z=1-2 x, x+z=y
$$

b) Find matrix $X$ such that $\left[\begin{array}{rr}4 & 5 \\ -3 & 6\end{array}\right]+X=\left[\begin{array}{rr}10 & -1 \\ 0 & -6\end{array}\right]$.
c) If $A=\left[\begin{array}{rr}1 & -2 \\ -3 & -1\end{array}\right], B=\left[\begin{array}{rrr}4 & 2 & -5 \\ 1 & 0 & 3\end{array}\right], C=\left[\begin{array}{rrr}6 & -7 & 0 \\ -1 & 2 & 5 \\ 1 & 0 & 3\end{array}\right]$, prove that $(A B) C=A(B C)$
d) Express the matrix $A$ as sum of symmetric and skew-symmetric matrix of

$$
A=\left[\begin{array}{rrr}
-1 & 7 & 1 \\
2 & 3 & 4 \\
5 & 0 & 5
\end{array}\right] .
$$

e) Resolve into partial fractions $\frac{x+5}{x^{2}-x}$.
f) Resolve into partial fractions $\frac{x^{2}+36 x+6}{(x-1)\left(x^{2}+2\right)}$.
3. Attempt any four of the following :
a) Find the inverse of the matrix $\left[\begin{array}{ccc}1 & 2 & 4 \\ -1 & 2 & 3 \\ 1 & 4 & 1\end{array}\right]$ using adjoint method.

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b) Solve by matrix method the following equations using inverse method $3 x+y+2 z=3,2 x-3 y-z=-3, x+2 y+z=4$
c) Resolve into partial fractions $\frac{x^{3}+1}{x^{2}+6 x}$.
d) Resolve into partial fractions $\frac{(\tan \theta+1)}{(\tan \theta+2)(\tan \theta+3)}$.
e) If $\cos A=\frac{-3}{5}, \sin B=\frac{20}{29}$, where $A$ and $B$ are the angles in the third and second quadrant respectively. Find $\tan (A+B)$.
f) Without using calculator find the value of $\sin \left(150^{\circ}\right)-\tan \left(315^{\circ}\right)+\cos \left(300^{\circ}\right)+\sec ^{2}\left(360^{\circ}\right)$.
4. Attempt any four of the following:
a) Prove that, $1+\tan A \cdot \tan 2 A=\sec 2 A$.
b) Prove that, $\sin (A-B)=\sin A \cdot \cos B-\cos A \cdot \sin B$.
c) If $A$ and $B$ both are obtuse angles and $\sin A=\frac{5}{13}, \cos B=\frac{-4}{5}$ then find the quadrant of angle $A+B$.
d) Prove that: $\frac{\sin 8 x-\sin 5 x}{\cos 7 x+\cos 6 x}=\sin x+\cos x \cdot \tan x / 2$.
e) Prove that: $2 \tan ^{-1} x=\tan ^{-1}\left[\frac{2 x}{1-x^{2}}\right]$.
f) Prove that, $\cos ^{-1}(4 / 5)+\tan ^{-1} 3 / 5=\tan ^{-1} \frac{27}{11}$.
5. Attempt any four of the following :
a) Prove that $\frac{\sin 4 \theta+\sin 2 \theta}{1+\cos 2 \theta+\cos 4 \theta}=\tan 2 \theta$.
b) Prove that $\frac{\sin 4 A+\sin 5 A+\sin 6 A}{\cos 4 A+\cos 5 A+\cos 6 A}=\tan 5 A$.
c) Prove that $\tan ^{-1} x+\tan ^{-1} y=\tan ^{-1}\left[\frac{x+y}{1-x y}\right]$.
d) Find the angle between the lines $y=5 x+6$ and $y=x$.
e) If $P\left(x_{1}, y_{1}\right)$ is any point and $A x+B y+C=0$ is a line, then prove that the perpendicular distance of a point $P$ from line is given by $\left|\frac{A x_{1}+B y_{1}+C}{\sqrt{A^{2}+B^{2}}}\right|$
f) Find the equation of line passing through the point of intersection of the lines $2 x+3 y=13,5 x-y=7$ and perpendicular to the line $3 x-y+7=0$.
6. Attempt any four of the following :
a) Find the equations of the lines passing through the point $(6,5)$ and parallel to the line having intercepts 2 and 4 on $X$ and $Y$ axis respectively.
b) Find the acute angle between the lines $3 x-2 y+4=0,2 x-3 y-7=0$.
c) The two sets of observations are given below:

## Set I

$\overline{\mathrm{x}}=82.5$
Set II
$\sigma=7.3$

$$
\bar{x}=98.75
$$

Which $\sigma=8.35$
Which of the two sets is more consistent?
d) Find variance and coefficient for the following data :

Class-intervals : 55-65 65-75 75-85 85-95 95-105 105-115115-125
$\begin{array}{llllllll}\text { No. of workers: } & 10 & 12 & 15 & 20 & 14 & 7 & 2\end{array}$
e) Calculate Standard deviation of the following table :

| Weekly Expenditure below : 05 | 10 | 15 | 20 | 25 |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| No. of Students | $: 06$ | 16 | 28 | 38 | 46 |

f) Calculate mean deviation about mean of the following distribution :

| $\mathbf{x i}$ | $:$ | 3 | 4 | 5 | 6 | 7 | 8 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\mathbf{f i}$ | $:$ | 4 | 9 | 10 | 8 | 6 | 3 |

