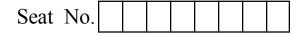# 17104

14115
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 <u>TEN</u> of the following:**   20

a) Find the value of: $\begin{vmatrix} 2 & 3 & 5 \\ 1 & 4 & 2 \\ 3 & 1 & 6 \end{vmatrix}$

b) If $A = \begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix}$, find the matrix B such that $2A + 3B = 0$

c) Find the value of a and b if

$$\begin{bmatrix} a-4b & 5 \\ 6 & -a+b \end{bmatrix} = \begin{bmatrix} 11 & 5 \\ 6 & -5 \end{bmatrix}$$

Marks

d) Find the adjoint of matrix $\begin{bmatrix} 4 & -6 \\ 1 & 7 \end{bmatrix}$

e) Resolve into the partial fractions:

$$\frac{x}{x^2-x-2}$$

f) Show that,

$$\tan\left(\frac{\pi}{4}-\theta\right) = \frac{1-\tan\theta}{1+\tan\theta}$$

g) Prove that: $\cos 2A = 2\cos^2 A - 1$

h) If $\sin A = 0.4$, find the value of $\sin 3A$

i) Prove that: $\dfrac{\cos 3\theta}{\cos\theta} + \dfrac{\sin 3\theta}{\sin\theta} = 4\cos 2\theta$

j) Evaluate without using calculator $\dfrac{\tan 66° + \tan 69°}{1 - \tan 66° \tan 69°}$

k) Find the slope and y-intercept of line

$$\frac{x}{4} - \frac{y}{3} = 2$$

l) Find range of the following 2, 3, 1, 10, 6, 31, 17, 20, 24

2. **Attempt any <u>FOUR</u> of the following:** 16

a) Solve the equations, for y and z

$$\frac{x}{4}-\frac{y}{3}+\frac{z}{2}=5, \quad \frac{x}{3}+\frac{y}{2}-\frac{z}{5}=11$$

$$\frac{x}{7}-\frac{y}{9}+\frac{z}{6}=-2, \text{ by using Cramer's rule.}$$

b) If $A=\begin{bmatrix} 2 & -1 & 1 \\ -2 & 3 & -2 \\ -4 & 4 & -3 \end{bmatrix}$, find A^2

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

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

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

$A^2-3A+9I$ where I is unit matrix.

e) Resolve into the partial fractions:

$$\frac{x^2+1}{2x^4+5x^2+2}$$

f) Resolve into partial fractions:

$$\frac{x^3+x}{x^2-9}$$

Marks

3. **Attempt any FOUR of the following:** **16**

a) Solve the equations $x + 2y + 3z = 1$, $2x + 3y + 2z = 2$ and $3x + 2y + 4z = 1$ by using matrix inversion method.

b) Resolve into the partial fractions: $\dfrac{x^2 + 23x}{(x-3)(x^2+1)}$

c) Resolve into the partial fractions: $\dfrac{e^x + 1}{2e^{2x} + 7e^x + 5}$

d) Prove that: $\sin(A+B) = \sin A \cos B + \cos A \sin B$

e) Prove that: $2\cot^{-1}(3) + \operatorname{cosec}^{-1}\left(\dfrac{5}{4}\right) = \dfrac{\pi}{2}$

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

4. **Attempt any FOUR of the following:** **16**

a) Without using the calculator find the value of:

$$\frac{4}{3\tan^2 30°} + 3\sin^2 120° = \operatorname{cosec}^2 30 - \frac{3}{4\cot^2 120°} + \cos^2 270°$$

b) Prove that: $\dfrac{\cos 3A + 2\cos 5A + \cos 7A}{\cos A + 2\cos 3A + \cos 5A} = \cos 2A - \sin 2A \tan 3A$

c) Prove that: $\tan A + \tan B + \tan C = \tan A \cdot \tan B \cdot \tan C$

d) Prove that: $\tan 3\theta = \dfrac{3\tan\theta - \tan^3\theta}{1 - 3\tan^2\theta}$

e) Prove that: $\cos^{-1}\left(\dfrac{4}{5}\right) + \cos^{-1}\left(\dfrac{12}{13}\right) = \cos^{-1}\left(\dfrac{33}{65}\right)$

f) If $\tan x = \dfrac{5}{6}$, $\tan y = \dfrac{1}{11}$. Show that $x + y = \dfrac{\pi}{4}$

5.   **Attempt any <u>FOUR</u> of the following:**   **16**

a) Without using calculator prove that:

$$\cos 20° \cos 40° \cos 60° \cos 80° = \frac{1}{16}$$

b) Prove that: $\dfrac{\sin 4x + \sin 5x + \sin 6x}{\cos 4x + \cos 5x + \cos 6x} = \tan 5x$

c) Prove that: $\tan^{-1}(x) + \tan^{-1}(y) = \tan^{-1}\left[\dfrac{x+y}{1-xy}\right]$ $x > 0,\ y > 0,\ xy < 1$

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

e) Find the equation of the straight line passing through (–3, 10) and sum of their intercept is 8.

f) Find the acute angle between the lines $2x + 3y = 13$ and $2x - 5y + 7 = 0$

6.   **Attempt any <u>FOUR</u> of the following:**   **16**

a) Find the equation of straight line passing through (5, 6) and making angle 150° with x-axis.

b) If the length of perpendicular from (5, 4) on the straight line $2x + y + k = 0$ is $4\sqrt{5}$ units. Find the value of k.

c) The scores of two batsmen A and B in ten innings during a certain season as under:

A	32	28	47	63	71	39	10	60	96	14
B	19	31	48	53	67	90	10	62	40	80

Find which of two batsmen is more consisting in scoring (use coefficient of variance).

Marks

d) Find the range and the coefficient of range for following data:

Marks	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No. of Students	10	15	16	20	21	22	09	08

e) Calculate the mean deviation for the following data:

Expenditure (Rs.)	40-59	60-79	80-99	100-119	120-139
No. of families	50	300	500	200	60

f) Find the variance and co-efficient of variance for the following distribution.

Class intervals	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65
Frequency	25	30	50	90	75	60	35	25	15

————