

Time: 3 Hrs.]

- Instructions :** (1) All Questions are compulsory.  
 (2) Figures to the right indicate full marks.  
 (3) Use of Non-programmable Electronic Pocket Calculator is permissible.

1. Attempt any **TEN** of the following :

[20]

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

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

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

(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 into the partial fractions :  $\frac{x}{x^2 - x - 2}$

(f) Without using calculator find the value of  $\sin(-330^\circ)$ .

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

(h) If  $\sin A = \frac{1}{2}$  find  $\sin 3A$ .

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

(j) Prove that  $\cos^{-1}(-x) = \pi - \cos^{-1}x$ .

(k) Find the slope and y-intercept of line  $\frac{x}{4} - \frac{y}{3} = 2$

(l) Find the range and the coefficient of range for the following data :  
 120, 100, 130, 50, 150

2. Attempt any **FOUR** of the following.

[16]

(a) Solve the equations, for y and z

$$\frac{x}{4} - \frac{y}{3} + \frac{z}{2} = 5, \quad \frac{x}{3} + \frac{y}{2} - \frac{z}{5} = 11, \quad \frac{x}{7} - \frac{y}{9} + \frac{z}{6} = -2, \text{ by using Cramer's rule.}$$

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

verify that  $A(B + C) = AB + AC$ .

(d) Using matrix inversion method, solve the equations.

$$5x + y = 13, \quad 3x + 2y = 5$$

(e) Resolve into the partial fractions :  $\frac{x^2 + 1}{2x^4 + 5x^2 + 2}$

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

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 partial fractions  $\frac{x^2}{(x^2 + 1)(x^2 + 2)}$ .
- (c) Resolve into the partial fractions :  $\frac{e^x + 1}{2e^{2x} + 7e^x + 5}$
- (d) Prove that  $\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \cdot \tan B}$
- (e) Prove that :  $2\cot^{-1}(3) + \operatorname{cosec}^{-1}\left(\frac{5}{4}\right) = \frac{\pi}{2}$ .
- (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** of the following. [16]
- (a) Without using the calculator find the value of :  

$$\frac{4}{3 \tan 30^\circ} + 3 \sin^2 120^\circ = \operatorname{cosec}^2 3\theta - \frac{3}{4 \cot^2 120^\circ} + \cos^2 270^\circ$$
- (b) Prove that  $\cos 3\theta = 4 \cos^3 \theta - 3 \cos \theta$ .
- (c) Prove that :  $\tan A + \tan B + \tan C = \tan A \cdot \tan B \cdot \tan C$
- (d) Prove that  $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ = \frac{3}{16}$ .
- (e) Prove that :  $\cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{33}{65}\right)$ .
- (f) Prove that  $\tan^{-1}(1) + \tan^{-1}(2) + \tan^{-1}(3) = \pi$ .

5. Attempt any **FOUR** of the following. [16]
- (a) Without using calculator prove that :  

$$\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$$
- (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 :  $\tan^{-1}(x) + \tan^{-1}(y) = \tan^{-1}\left[\frac{x+y}{1-xy}\right]$   $x > 0, y > 0, xy < 1$ .
- (d) Prove that if  $\theta$  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 the straight line passing through  $(-3, 10)$  and sum of their intercept is 8.
- (f) Find the length of the perpendicular from  $(3, 2)$  on the line  $4x - 6y - 5 = 0$ .

6. Attempt any **FOUR** of the following. [16]
- (a) Find the equation of straight line passing through  $(5, 6)$  and making angle  $150^\circ$  with x-axis.
- (b) Find the equation of straight line passing through the points  $(-4, 6)$  and  $(8, -3)$ .
- (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).
- (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) 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 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

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**Paper Discussion Schedule for FY Diploma Sem-I**

Date	Day	Timing	Centres
20 Nov. 2016	Sunday	9 a.m. to 11 a.m.	Dadar, Ghatkopar
20 Nov. 2016	Sunday	12 a.m. to 2 p.m.	Andheri, Chembur Nerul, Panvel
20 Nov. 2016	Sunday	3 p.m. to 5 p.m.	Borivali , Thane, Kalyan