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Numerical Method & Algebra

Assignment -2

1)

$$\begin{bmatrix} 1 & 2 \\ a & 0 \end{bmatrix} \begin{bmatrix} 3 & b \\ -4 & 1 \end{bmatrix} = \begin{bmatrix} -5 & 6 \\ 12 & 16 \end{bmatrix}$$

$$\begin{bmatrix} 3-8 & b+2 \\ 3a & ab \end{bmatrix} = \begin{bmatrix} -5 & 6 \\ 12 & 16 \end{bmatrix}$$

$$b + 2 = 6$$
$$b = 4$$

$$3a = 12$$
$$\boxed{a = 4}$$

$$a = 4 \quad , b = 4$$

2) $$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$A^{20} = [A^2]^{10}$$

$$A^2 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 0 & 0 \end{bmatrix}$$

Ca

$A^2 = I$

$\therefore$ Now, $(I)^{10} = I$

$$A^{20} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

3) $$\begin{vmatrix} 1 & \lambda & 0 \\ 3 & 2 & 0 \\ 1 & 1 & 1 \end{vmatrix} = 1(2) - \lambda(3).$$

$= 2 - \lambda 3 = 0$

$2 = \lambda 3$

$$\boxed{\lambda = \frac{2}{3}}$$

4) Total Revenue :- Sales * each price.

matrix for sales

	W.B	C.F	F.M
Mumbai	20	10	8
Pune	15	12	4

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price matrix

	Not dis.	discounted
W.B	700	600
C.F	300	200
F.M	1200	1000

Revenue matrix :

$$\begin{bmatrix} 20 & 10 & 8 \\ 15 & 12 & 4 \end{bmatrix} \times \begin{bmatrix} 700 & 600 \\ 300 & 200 \\ 1200 & 1000 \end{bmatrix}$$

3

$$\begin{bmatrix} 14000+3000+9600 & 12000+2000+800 \\ 10,500+3600+4800 & 9000+2400+40 \end{bmatrix}$$

14
96
11000

$$\begin{bmatrix} 26600 & 22000 \\ 18900 & 15400 \end{bmatrix}$$

Revenue matrix is

	undiscount	Discounte
Mumbai	26,600	22,000
pune	18,900	15,400

Co

Q.5 To find first term & common difference

n^{th} term of AP : $a_n = a + (n-1)d$

Given conditions:—

A.P :- $a \quad a+d \quad a+2d \quad a+3d \ldots$

$$a + 3d = 3a \quad \text{—} \quad (1)$$

$$a + 6d = 2(a+2d) + 1 \quad \text{—} \quad (2)$$

according to (1)

$$3d = 2a$$
$$d = \frac{2}{3}a.$$

put in (2).

$$a + 6 \times \frac{2}{3}a = 2\left(a + 2 \times \frac{2}{3}a\right) + 1$$

$$a + 4a = 2\left(a + \frac{4}{3}a\right) + 1$$

$$5a = 2\left(\frac{7a}{3}\right) + 1$$

$$5a = \frac{14a}{3} + 1$$

$$5a = \frac{14a + 3}{3}$$

$$15a = 14a + 3$$

$$\boxed{a = 3}, \quad \boxed{d = 2}$$

Q6 T.P.

a a+d a+2d a+3d

$7(a+6d) = 11(a+10d)$

To show:- $(a+17d) = 0$

So,

$7a+42d = 11a+110d$

$7a-11a = 110d-42d$

$-4a = 68d$

$4a+68d = 0$

$a+17d = 0$

Hence Proved.

Q7 Sum of arithematic series

$S_n = \frac{n}{2}[2a+(n-1)d]$

$S_{20} = \frac{20}{2}[2a+19d] = 10[2a+19d]$

$S_{22} = \frac{22}{2}[2a+21d] = 11[2a+21d]$

$10[2a+19d] = 11[2a+21d]$

$d = -2$

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$10[2a + 19x - 2] = 11[2a + 21x - 2]$

$10[2a - 38] = 11[2a - 42]$

$20a - 380 = 22a - 462$

$462 - 380 = 22a - 20a$

$82 = 2a$

$\boxed{a = 41}$

Q.8] $S_n = 2n^2 + 5n$ — (1)

Sum of A.P.

$S_n = \frac{n}{2}[2a + (n-1)d]$

$= na + \frac{(n-1)n}{2} \times d$

~~$= na + \frac{n^2 - n}{2} \times d \quad \frac{(n-1)d}{2} \times n$~~

$= na + \frac{n^2 d}{2} - \frac{nd}{2}$

$= n^2\left(\frac{d}{2}\right) + n\left(a - \frac{d}{2}\right)$

Comparing with eq^n 0

$\frac{d}{2} = 2 \quad , \; a - \frac{d}{2} = 5$

$\boxed{d = 4}$

$a - \frac{d}{2} = 5$

$a - \frac{4}{2} = 5$

$a = 5 + 2$

$\boxed{a = 7}$

Q.9 $1 \; 1 \; 1 \; \ldots \; 1$ (91 times)

$1 + 10 + 100 + 1000 \ldots + 10^{90}$

$a = 1 \; , \; n = 91 \; , \; r = 10$

$S_n = \frac{a_1 (r^n - 1)}{(r - 1)}$

$= \frac{1 \times (10^{91} - 1)}{10 - 1}$

$\boxed{d = 4}$

$a - \frac{d}{2} = 5$

$a - \frac{4}{2} = 5$

$a = 5 + 2$

$\boxed{a = 7}$

Eg $1 \; 1 \; 1 \; \ldots \; 1$ (91 times)

$1 + 10 + 100 + 1000 \ldots + 10^{90}$

$a = 1 \; , \; n = 91 \; , \; r = 10$

$S_n = \frac{a_1 (r^n - 1)}{(r - 1)}$

$= \frac{1 \times (10^{91} - 1)}{10 - 1}$

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(10) G.P :- $a, ar, ar^2, ar^3 \ldots$

$$a + ar + ar^2 = 31$$

$$a^2 + (ar)^2 + (ar^2)^2 = 651$$

$$a(1 + r + r^2) = 31 \quad \text{— (1)}$$

$$a^2(1 + r^2 + r^4) = 651 \quad \text{— (2)}$$

Squaring eqn (1)

$$[a(1 + r + r^2)]^2 =$$

$$a^2(1 + r^2 + r^4 + 2r + 2r^2 + 2r^3) = 961$$

$$a^2(1 + r^2 + r^4) + a^2 2r(1 + r + r^2) = 961$$

equation (1) & (2)

$$651 + 2ar(31) = 961$$

$$2ar\,31 = 310$$

$$62ar = 310$$

$$ar = 5$$

$$a = \frac{5}{r}$$

equate in eqn (1)

$a(1+r+r^2) = 31$

$\frac{5}{r}(1+r+r^2) = 31$

$\frac{5}{r} + 5 + 5r = 31$

$\frac{5}{r} + 5r = 26$

$\frac{5 + 5r^2}{r} = 26$

$5 + 5r^2 = 26r$

$5r^2 - 26r + 5 = 0$

$5r^2 - 25r - r + 5 = 0$

$5r(r-5) - 1(r-5) = 0$

$(r-5)(5r-1) = 0$

$r = 5, \quad 5r = 1$

$r = \frac{1}{5}$

$r = 5, \quad a = \frac{5}{r} = \frac{5}{5} = 1$

$r = \frac{1}{5}, \quad a = \frac{5}{\frac{1}{5}} = 25$

The number are 1, 5, 25