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படங்களை தொடுக! பாடசாலை வலைதளத்தை சமூக ஊடகங்களில்
பின்தொடர்க!! உடனுக்குடன் புதிய செய்திகளை Notifications-ல் பெறுக!



12th Standard	Syllabus	Books	Study Materials – EM	Study Materials - TM	Practical	Online Test (EM & TM)
	Monthly Q&A	Mid Term Q&A	Revision Q&A	PTA Book Q&A	Centum Questions	Creative Questions
	Quarterly Exam	Half Yearly Exam	Public Exam	NEET		

11th Standard	Syllabus	Books	Study Materials – EM	Study Materials - TM	Practical	Online Test (EM & TM)
	Monthly Q&A	Mid Term Q&A	Revision Q&A	Centum Questions	Creative Questions	
	Quarterly Exam	Half Yearly Exam	Public Exam	NEET		

10th Standard	Syllabus	Books	Study Materials – EM	Study Materials - TM	Practical	Online Test (EM & TM)
	Monthly Q&A	Mid Term Q&A	Revision Q&A	PTA Book Q&A	Centum Questions	Creative Questions
	Quarterly Exam	Half Yearly Exam	Public Exam	NTSE	SLAS	

9th Standard	Syllabus	Books	Study Materials	1st Mid Term	2nd Mid Term	3rd Mid Term
	Quarterly Exam	Half Yearly Exam	Annual Exam	RTE		

8th Standard	Syllabus	Books	Study Materials	1st Mid Term	2nd Mid Term	3rd Mid Term
	Term 1	Term 2	Term 3	Public Model Q&A	NMMS	Periodical Test

7th Standard	Syllabus	Books	Study Materials	1st Mid Term	2nd Mid Term	3rd Mid Term
	Term 1	Term 2	Term 3	Periodical Test	SLAS	

6th Standard	Syllabus	Books	Study Materials	1st Mid Term	2nd Mid Term	3rd Mid Term
	Term 1	Term 2	Term 3	Periodical Test	SLAS	

1st to 5th Standard	Syllabus	Books	Study Materials	Periodical Test	SLAS	
	Term 1	Term 2	Term 3	Public Model Q&A		

Exams	TET	TNPSC	PGTRB	Polytechnic	Police	Computer Instructor
	DEO	BEO	LAB Asst	NMMS	RTE	NTSE

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Exercise 1.1.

$$i) \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$$

$$\text{Sol: } A = \begin{vmatrix} 5 & 6 \\ 7 & 8 \end{vmatrix}$$

$$= 40 - 42$$

$$= -2 \neq 0$$

$$\therefore \rho(A) = 2$$

$$ii) \begin{bmatrix} 1 & -1 \\ 3 & -6 \end{bmatrix}$$

$$\text{Sol: } A = \begin{vmatrix} 1 & -1 \\ 3 & -6 \end{vmatrix}$$

$$= -6 + 3$$

$$= -3 \neq 0$$

$$\therefore \rho(A) = 2$$

$$iii) \begin{bmatrix} 1 & 4 \\ 2 & 8 \end{bmatrix}$$

$$\text{Sol: } A = \begin{vmatrix} 1 & 4 \\ 2 & 8 \end{vmatrix}$$

$$= 8 - 8$$

$$= 0$$

$$\therefore \rho(A) = 1$$

$$iv) \begin{bmatrix} 2 & -1 & 1 \\ 3 & 1 & -5 \\ 1 & 1 & 1 \end{bmatrix}$$

$$\text{Sol: } A = \begin{vmatrix} 2 & -1 & 1 \\ 3 & 1 & -5 \\ 1 & 1 & 1 \end{vmatrix}$$

$$= 2 \begin{vmatrix} 1 & -5 \\ 1 & 1 \end{vmatrix} + 1 \begin{vmatrix} 3 & -5 \\ 1 & 1 \end{vmatrix} + 1 \begin{vmatrix} 3 & 1 \\ 1 & 1 \end{vmatrix}$$

$$= 2(1+5) + 1(3+5) + 1(3-1)$$

$$= 2(6) + 1(8) + (2)$$

$$= 12 + 8 + 2$$

$$= 22 \neq 0$$

$$\therefore \rho(A) = 3$$

$$v) \begin{bmatrix} -1 & 2 & -2 \\ 4 & -3 & 4 \\ -2 & 4 & -4 \end{bmatrix}$$

$$\text{Sol: } A = \begin{vmatrix} -1 & 2 & -2 \\ 4 & -3 & 4 \\ -2 & 4 & -4 \end{vmatrix}$$

$$= -1 \begin{vmatrix} -3 & 4 \\ 4 & -4 \end{vmatrix} - 2 \begin{vmatrix} 4 & 4 \\ -2 & -4 \end{vmatrix} - 2 \begin{vmatrix} 4 & -3 \\ -2 & 4 \end{vmatrix}$$

$$= -1(12-16) - 2(-16+8) - 2(16-6)$$

$$= -1(-4) - 2(-8) - 2(10)$$

$$= 4 + 16 - 20$$

$$= 20 - 20$$

$$= 0$$

$$\text{Consider } \begin{vmatrix} -1 & 2 \\ 4 & -3 \end{vmatrix} = 3 - 8 = -5$$

$$\therefore \rho(A) = 2$$

$$vi) \begin{bmatrix} 1 & 2 & -1 & 3 \\ 2 & 4 & 1 & -2 \\ 3 & 6 & 3 & -7 \end{bmatrix}$$

$$Sol: A = \begin{bmatrix} 1 & 2 & -1 & 3 \\ 2 & 4 & 1 & -2 \\ 3 & 6 & 3 & -7 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - 2R_1$$

$$R_3 \rightarrow R_3 - 3R_1$$

$$\hookrightarrow \begin{bmatrix} 1 & 2 & -1 & 3 \\ 0 & 0 & 3 & -8 \\ 0 & 0 & 6 & -16 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - 2R_2$$

No. of non-zero rows is

$$\hookrightarrow \begin{bmatrix} 1 & 2 & -1 & 3 \\ 0 & 0 & 3 & -8 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

No. of non-zero rows is 2

$$\therefore \rho(A) = 2$$

$$vii) \begin{bmatrix} 3 & 1 & -5 & -1 \\ 1 & -2 & 1 & -5 \\ 1 & 5 & -7 & 2 \end{bmatrix}$$

$$Sol: A = \begin{bmatrix} 3 & 1 & -5 & -1 \\ 1 & -2 & 1 & -5 \\ 1 & 5 & -7 & 2 \end{bmatrix}$$

$$R_2 \leftrightarrow R_1$$

$$\hookrightarrow \begin{bmatrix} 1 & -2 & 1 & -5 \\ 3 & 1 & -5 & -1 \\ 1 & 5 & -7 & 2 \end{bmatrix}$$

$$R_2 \rightarrow R_2 - 3R_1$$

$$R_3 \rightarrow R_3 - R_1$$

$$\hookrightarrow \begin{bmatrix} 3 & 1 & -5 & -1 \\ 0 & 7 & -8 & 14 \\ 0 & 7 & -8 & 7 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - R_2$$

$$\hookrightarrow \begin{bmatrix} 3 & 1 & -5 & -1 \\ 0 & 7 & -8 & 14 \\ 0 & 0 & 0 & 7 \end{bmatrix}$$

No. of non-zero rows is 3

$$\therefore \rho(A) = 3$$

$$viii) \begin{bmatrix} 3 & -2 & 3 & 4 \\ -2 & 4 & -1 & -3 \\ -1 & 2 & 7 & 6 \end{bmatrix}$$

$$Sol: A = \begin{bmatrix} 1 & -2 & 3 & 4 \\ -2 & 4 & -1 & -3 \\ -1 & 2 & 7 & 6 \end{bmatrix}$$

$$R_2 \rightarrow R_2 + 2R_1$$

$$R_3 \rightarrow R_3 + R_1$$

$$\hookrightarrow \begin{bmatrix} 1 & -2 & 3 & 4 \\ 0 & 0 & 5 & 5 \\ 0 & 0 & 10 & 10 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - 2R_2$$

$$\hookrightarrow \begin{bmatrix} 1 & -2 & 3 & 4 \\ 0 & 0 & 5 & 5 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

No. of non Zero rows is 2

$$\therefore \rho(A) = 2.$$

2) If $A = \begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 1 & -2 & 3 \\ -2 & 4 & -6 \\ 5 & 1 & -1 \end{bmatrix}$

then find the rank of AB and rank of BA.

Sol: $AB = \begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix} \begin{bmatrix} 1 & -2 & 3 \\ -2 & 4 & -6 \\ 5 & 1 & -1 \end{bmatrix}$

$$= \begin{bmatrix} (1-2-5) & (-2+4-1) & (3-6+1) \\ (2+6+20) & (-4-12+4) & (6+18-4) \\ (3+4+15) & (-6-8+3) & (9+12-3) \end{bmatrix}$$

$$= \begin{bmatrix} -6 & 1 & -2 \\ 28 & -12 & 20 \\ 22 & -11 & 18 \end{bmatrix}$$

$$R_2 \rightarrow 6R_2 + 28R_1$$

$$R_3 \rightarrow 6R_3 + 22R_1$$

$$\sim \begin{bmatrix} -6 & 1 & -2 \\ 0 & -44 & 64 \\ 0 & -44 & 64 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - R_1$$

$$\sim \begin{bmatrix} -6 & 1 & -2 \\ 0 & -44 & 64 \\ 0 & 0 & 0 \end{bmatrix}$$

$$\therefore \rho(AB) = 2$$

$$BA = \begin{bmatrix} 1 & -2 & 3 \\ -2 & 4 & -6 \\ 5 & 1 & -1 \end{bmatrix} \begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$$

$$= \begin{bmatrix} (1-4+9) & (1+6-6) & (-1-8+9) \\ (-2+8-18) & (-2-12+12) & (2+16-18) \\ (5+2-3) & (5-3+2) & (-5+4-3) \end{bmatrix}$$

$$= \begin{bmatrix} 6 & 1 & 0 \\ -12 & -2 & 0 \\ 4 & 4 & -4 \end{bmatrix}$$

$$R_2 \rightarrow R_2 + 2R_1$$

$$\sim \begin{bmatrix} 6 & 1 & 0 \\ 0 & 0 & 0 \\ 4 & 4 & -4 \end{bmatrix}$$

$$R_3 \rightarrow 6R_3 - 4R_1$$

$$\sim \begin{bmatrix} 6 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 20 & -24 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - 20R_1$$

$$\sim \begin{bmatrix} 6 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & -24 \end{bmatrix}$$

$$\therefore \rho(BA) = 2$$

Rank of AB is = 2

Rank of BA is = 2

Solve the following by rank method $x+y+z=9$,
 $2x+5y+7z=52$,
 $2x+y-z=0$.

$$\begin{aligned} x+y+z &= 9 \\ 2x+5y+7z &= 52 \\ 2x+y-z &= 0 \end{aligned}$$

$$A \cdot X = B$$

$$\begin{pmatrix} 1 & 1 & 1 \\ 2 & 5 & 7 \\ 2 & 1 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 9 \\ 52 \\ 0 \end{pmatrix}$$

Augmented matrix

$$= \begin{pmatrix} 1 & 1 & 1 & 9 \\ 2 & 5 & 7 & 52 \\ 2 & 1 & -1 & 0 \end{pmatrix}$$

$$R_2 \rightarrow R_2 - 2R_1$$

$$R_3 \rightarrow R_3 - 2R_1$$

$$\sim \begin{pmatrix} 1 & 1 & 1 & 9 \\ 0 & 3 & 5 & 34 \\ 0 & -4 & -8 & -52 \end{pmatrix}$$

$$\sim \begin{pmatrix} 1 & 1 & 1 & 9 \\ 0 & 3 & 5 & 34 \\ 0 & 0 & -4 & -20 \end{pmatrix}$$

$$\rho(A) = 3 \quad \rho(A, B) = 3$$

$$x + y + z = 9$$

$$3y + 5z = 34$$

$$-4z = -20$$

$$z = \frac{-20}{-4}$$

$$\boxed{z = 5}$$

Sub z in ②

$$3y + 5(5) = 34$$

$$3y + 25 = 34$$

$$3y = 34 - 25$$

$$3y = 9$$

$$y = 9/3$$

$$\boxed{y = 3}$$

Sub z and y in ①

$$x + 5 + 5 = 9$$

$$x + 8 = 9$$

$$x = 9 - 8$$

$$\boxed{x = 1}$$

$$x = 1, y = 3, z = 5$$

4)

$$5x + 3y + 7z = 4$$

$$3x + 26y + 2z = 9$$

$$7x + 2y + 10z = 5$$

$$A \cdot X = B$$

$$\begin{pmatrix} 5 & 3 & 7 \\ 3 & 26 & 2 \\ 7 & 2 & 10 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 4 \\ 9 \\ 5 \end{pmatrix}$$

Augmented Matrix

$$\begin{pmatrix} 5 & 3 & 7 & 4 \\ 3 & 26 & 2 & 9 \\ 7 & 2 & 10 & 5 \end{pmatrix}$$

$$R_2 \rightarrow 5R_2 - 3R_1$$

$$R_3 \rightarrow 5R_3 - 7R_1$$

$$\sim \begin{pmatrix} 5 & 3 & 7 & 4 \\ 0 & 121 & -11 & 33 \\ 0 & -11 & 1 & -3 \end{pmatrix}$$

$$R_3 \rightarrow 11R_3 + R_2$$

$$\sim \begin{pmatrix} 5 & 3 & 7 & 4 \\ 0 & 12 & -11 & 33 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\rho(A, B) = 2 \quad \rho(A) = 2$$

No. of Unknown = 3.

$$5x + 3y + 7z = 4$$

$$12y - 11z = 33$$

$$\boxed{z = k}$$

$$12y - 11k = 33$$

$$12y - k = 3$$

$$12y = 3 + k$$

$$\boxed{y = \frac{3+k}{12}}$$

$$5x + 3\left(\frac{3+k}{12}\right) + 7k = 4$$

$$55x + 9 + 3k + 71k = 44$$

$$55x + 80k + 9 = 44$$

$$55x + 80k = 44 - 9$$

$$55x = 35 - 80k$$

$$x = \frac{35 - 80k}{55}$$

$$x = \frac{5(7 - 16k)}{55}$$

$$x = \frac{7 - 16k}{11}$$

$$\text{The Solution } x = \frac{7 - 16k}{11}$$

$$y = \frac{3+k}{12} \text{ and } z = k$$

5)

$$x + y + z = 3$$

$$x + 2y + 3z = 4$$

$$x + 4y + 9z = 6$$

$$\begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3 \\ 4 \\ 6 \end{pmatrix}$$

Augmented matrix

$$\begin{pmatrix} 1 & 1 & 1 & 3 \\ 1 & 2 & 3 & 4 \\ 1 & 4 & 9 & 6 \end{pmatrix} \begin{matrix} R_2 \rightarrow R_2 - R_1 \\ R_3 \rightarrow R_3 - R_1 \end{matrix}$$

$$\sim \begin{pmatrix} 1 & 1 & 1 & 3 \\ 0 & 1 & 2 & 1 \\ 0 & 3 & 8 & 3 \end{pmatrix} \begin{matrix} \\ \\ R_3 \rightarrow R_3 - 3R_2 \end{matrix}$$

$$\sim \begin{pmatrix} 1 & 1 & 1 & 3 \\ 0 & 1 & 2 & 1 \\ 0 & 0 & 2 & 0 \end{pmatrix}$$

$$\rho(A) = 3 \quad \rho(A, B) = 3$$

No. of Unknowns = 3

The System is consistent and Unique.

$$x + y + z = 3$$

$$y + 2z = 1$$

$$2z = 0$$

$$z = 0$$

$$\boxed{z = 0}$$

$$y + 2z = 1$$

$$y + 2(0) = 1$$

$$\boxed{y = 1}$$

$$x + y + z = 3$$

$$x + 1 + 0 = 3$$

$$x = 3 - 1$$

$$\boxed{x = 2}$$

$$x = 2, y = 1, z = 0$$

b)

$$3x - y + \lambda z = 1$$

$$2x + y + z = 2$$

$$x + 2y - \lambda z = -1$$

$$\left(\begin{array}{ccc|c} 3 & -1 & \lambda & 1 \\ 2 & 1 & 1 & 2 \\ 1 & 2 & -\lambda & -1 \end{array} \right) \begin{array}{l} x \\ y \\ z \end{array} = \begin{array}{l} 1 \\ 2 \\ -1 \end{array}$$

Augmented Matrix

$$\left(\begin{array}{ccc|c} 3 & -1 & \lambda & 1 \\ 2 & 1 & 1 & 2 \\ 1 & 2 & \lambda & 1 \end{array} \right) R_3 \leftrightarrow R_1$$

$$\left(\begin{array}{ccc|c} 1 & 2 & \lambda & 1 \\ 2 & 1 & 1 & 2 \\ 3 & -1 & \lambda & 1 \end{array} \right) \begin{array}{l} R_2 \rightarrow R_2 - 2R_1 \\ R_3 \rightarrow R_3 - 3R_1 \end{array}$$

$$\left(\begin{array}{cccc} 1 & 2 & -\lambda & -1 \\ 0 & -3 & 1+2\lambda & 4 \\ 0 & -7 & 4\lambda & 4 \end{array} \right) R_3 \rightarrow 3R_3 - 7$$

$$\left(\begin{array}{cccc} 1 & 2 & -\lambda & -1 \\ 0 & -3 & 1+2\lambda & 4 \\ 0 & 0 & -7-2\lambda & -16 \end{array} \right)$$

The given Condition failed to have unique solution.

$$-7 - 2\lambda = 0$$

$$-2\lambda = 7$$

$$\boxed{\lambda = -7/2}$$

7)

purchase (-)
sell (+)

$$2x + 3y - 6z = 15000$$

$$3x - y + 2z = 2000$$

$$-x + 3y + z = 5500$$

$$\left(\begin{array}{ccc|c} 2 & 3 & -6 & 15000 \\ 3 & -1 & 2 & 2000 \\ -1 & 3 & 1 & 5500 \end{array} \right) \begin{array}{l} x \\ y \\ z \end{array} = \begin{array}{l} 15000 \\ 2000 \\ 5500 \end{array}$$

Augmented matrix

$$\left(\begin{array}{ccc|c} 2 & 3 & -6 & 15000 \\ 3 & -1 & 2 & 2000 \\ -1 & 3 & 1 & 5500 \end{array} \right)$$

$$R_3 \leftrightarrow R_1$$

$$\begin{pmatrix} -1 & 3 & 1 & 5500 \\ 3 & -1 & 2 & 2000 \\ 2 & 3 & -6 & 5000 \end{pmatrix} \begin{array}{l} R_2 \rightarrow R_2 + 3R_1 \\ R_3 \rightarrow R_3 + 2R_1 \end{array}$$

$$\sim \begin{pmatrix} -1 & 3 & 1 & 5500 \\ 0 & 8 & 5 & 18500 \\ 0 & 9 & -4 & 16000 \end{pmatrix} \quad R_3 \rightarrow 8R_3 - 9R_2$$

$$\sim \begin{pmatrix} -1 & 3 & 1 & 5500 \\ 0 & 8 & 5 & 18500 \\ 0 & 0 & -71 & -38500 \end{pmatrix}$$

$$\rho(A) = 3 \quad \rho(A, B) = 3$$

No. of Unknowns = 3

The given system is consistent and has unique solution.

$$-x + 3y + z = 5500$$

$$8y + 5z = 18500$$

$$+ 71z = +38500$$

$$z = \frac{38500}{71}$$

$$\boxed{z = 500}$$

$$8y + 5(500) = 18500$$

$$8y + 2500 = 18500$$

$$8y = 18500 - 2500$$

$$8y = 16000$$

$$y = \frac{16000}{8}$$

$$\boxed{y = 2000}$$

$$\begin{aligned} -x + 3(2000) + 500 &= 5500 \\ -x + 6000 + 500 &= 5500 \\ -x + 6500 &= 5500 \end{aligned}$$

$$-x = 5500 - 6500$$

$$-x = -1000$$

$$\boxed{x = 1000}$$

The price three commodities is ₹ 1000, ₹ 2000, ₹ 500.

$$8) \quad x + y + z = 5000$$

$$6\%x + 7\%y + 8\%z = 358$$

$$\frac{6}{100} \times 100x + \frac{7}{100} \times 100y + \frac{8}{100} \times 100z = 358$$

$$6x + 7y + 8z = 35800$$

$$6\%x + 7\%y = 70 + 8\%z$$

$\times 100$

$$6x + 7y = 7000 + 8z$$

$$6x + 7y - 8z = 7000$$

$$\begin{pmatrix} 1 & 1 & 1 & | & x \\ 6 & 7 & 8 & | & y \\ 6 & 7 & -8 & | & z \end{pmatrix} \begin{array}{l} A \\ X = B \\ \end{array} \begin{pmatrix} 5000 \\ 35800 \\ 7000 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 1 & 1 & 5000 \\ 6 & 7 & 8 & 35800 \\ 6 & 7 & -8 & 7000 \end{pmatrix}$$

$$R_2 \rightarrow R_2 - 6R_1$$

$$R_3 \rightarrow R_3 - 6R_1$$

$$\sim \begin{pmatrix} 1 & 1 & 1 & 5000 \\ 0 & 1 & 2 & 5800 \\ 0 & 0 & -16 & -28800 \end{pmatrix}$$

$$\rho(A) = 3 \quad \rho(A, B) = 3$$

No. of unknowns = 3.

$$x + y + z = 5000$$

$$y + 2z = 5800$$

$$-16z = -28800$$

$$z = \frac{28800}{16}$$

$$\boxed{z = 1800}$$

$$y + 2(1800) = 5800$$

$$y + 3600 = 5800$$

$$y = 5800 - 3600$$

$$\boxed{y = 2200}$$

$$x + 2200 + 1800 = 5000$$

$$x + 4000 = 5000$$

$$x = 5000 - 4000$$

$$\boxed{x = 1000}$$

$\therefore$ The amount of investment in each bond is ₹ 1000, ₹ 2,200 and ₹ 1800.

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