

HindPhotostat



Hind Photostat & Book Store

Best Quality Classroom Topper Hand Written Notes to Crack GATE, IES, PSU's & Other Government Competitive/ Entrance Exams

MADE EASY
IES/GATE/PSU
MATHEMATICS
BY-SREEKAR SIR

- Theory
- Explanation
- Derivation
- Example
- Shortcuts
- Previous Years Question With Solution

Visit us:-www.hindphotostat.com

Courier Facility All Over India
(DTDC & INDIA POST)
Mob-9311989030



HindPhotostat



PROFILE

Visit us:- www.hindphotostat.com

Name

• [bit.ly | Basicmaths](https://bit.ly/basicmaths) - basic

Subject

• @SRIKARGUPTAMATHS - Telegram

Academic year

• Semester [bit.ly | 2021 key](https://bit.ly/2021key) - W.B.

Address

Contact linear algebra $\phi. 57$ (d)

Branch

• [bit.ly | stdlimits](https://bit.ly/stdlimits) - standard limit

Professor in charge

• [bit.ly | msqwb](https://bit.ly/msqwb)

Institute / university / school

Print ✓ [bit.ly | ENIGMATHNOTES](https://bit.ly/ENIGMATHNOTES)

✓ [bit.ly | Corre G](https://bit.ly/CorreG)

mb. [bit.ly | Atnote 2021](https://bit.ly/Atnote2021)

• [bit.ly | 2021 wbsoln.](https://bit.ly/2021wbsoln)

• [bit.ly | VC-2020](https://bit.ly/VC-2020)

• [bit.ly | msq key](https://bit.ly/msqkey)

msq key: ch-1

remove $\phi. 8, 9$

ans. 8 = (a, b)

Important notes

PLEASE CONTACT FOR :- [9311989030](tel:9311989030) , [9560163471](tel:9560163471) , [9711475393](tel:9711475393)

PHOTOSAT COLOR B/W (LASER-DIGITAL)

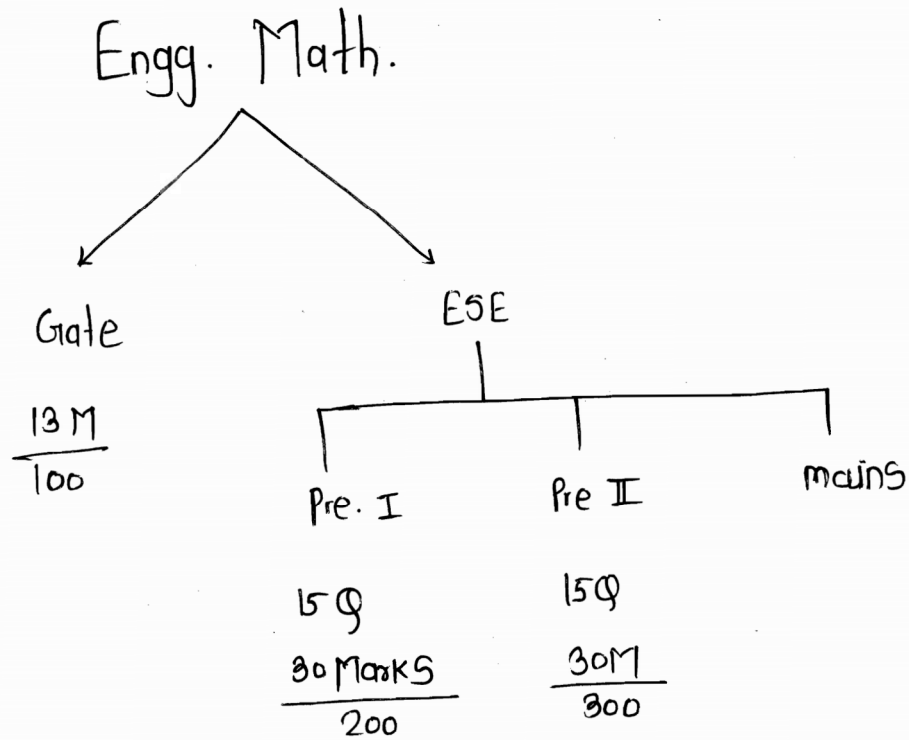
PRINTOUT COLOR B/W FROM COMPUTER

ALL PREVIOUS PAPER AVAILABLE

ALL HANDWRITTEN CLASS NOTES

ALL NOTES BOOKS AVAILABLE ALL STUDY MATERIAL AVAILABLE

COURIERS SERVICE AVAILABLE



• Syllabus :

Gate

- ① Linear algebra
- ② Differential Equations
- ③ Vector Calculus
- ④ Diff. Equⁿ
- ⑤ Complex Analysis
- ⑥ Fourier series
- ⑦ Probability

ESE

- ① Numerical methods



Linear Algebra

- Linear system \neq Linear transformation

$$AX = B$$

$$AX = Y$$

Let, $x =$ Cost of q pens

$y =$ Cost of pencil

	Pen	pencil	Cost
I-day	3	2	50
II day	2	1	30

Linear eqⁿ: $3x + 2y = 50$

$$2x + 1y = 30$$

by solving both, $x=10, y=10$

$$\begin{matrix} A & X & = & B \\ \begin{bmatrix} 3 & 2 \\ 2 & 1 \end{bmatrix} & \begin{bmatrix} x \\ y \end{bmatrix} & = & \begin{bmatrix} 50 \\ 30 \end{bmatrix} \end{matrix} \quad \text{--- matrix Form}$$

- Linear algebra deals with linear systems & Linear transformation.
- As every Ls. & L.T. can be expressed in matrix form & there by applying matrix methods.

Matrices:

defⁿ: The Arrangement of rows & Columns.

$$A = [a_{ij}]_{m \times n}$$

\swarrow order of matrix
 \searrow element in i^{th} row & j^{th} Column's

$m = \text{no. of rows}$

$n = \text{no. of Column's}$

- If $m=n$, $A_{n \times n}$ is a square matrix.
- If $m \neq n$, $A_{m \times n}$ is a Rectangular matrix.
- Lower triangular matrix:

$$A = [a_{ij}]_{n \times n}$$

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \dots$$

$i > j$ \rightarrow a_{31} a_{32} a_{33}

Principle diagonal element

if above the principle diagonal elements are zero (0)
then it is called as Lower triangular matrix.

$$A = [a_{ij}]_{n \times n} \text{ is L.T.M.}$$

if all $a_{ij} = 0$ for $i < j$

$$L = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 2 & 0 \\ 0 & 1 & 3 \end{bmatrix}$$

• Upper triangular matrix:

if below the principle diagonal element are zero (0)
then it is called as Upper triangular element matrix.

$$A = [a_{ij}]_{n \times n} \text{ is U.T.M.}$$

if $a_{ij} = 0$ for $i > j$

$$U = \begin{bmatrix} 2 & 0 \\ 0 & 2 & 2 \\ 0 & 0 & 3 \end{bmatrix}$$

• Diagonal matrix:

$D = [d_{ij}]_{n \times n}$ is a diagonal matrix,

if $d_{ij} = 0$ for $i \neq j$; e.g. $D = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$

- Scalar matrix :

$A = [a_{ij}]_{n \times n}$ is a scalar matrix, if all

$$a_{ij} = 0 \quad \text{for } i \neq j$$

$$a_{ii} = k$$

e.g.
$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$

• Operations on Matrices:

- Addition & Subtraction:

$$A \pm B, \quad \text{if } o(A) = o(B)$$

- Product of matrices:

If $A_{m \times n}, B_{p \times q}$

$(A \cdot B)_{m \times q}$ is possible only if $n = p$

(no. of columns of A = no. of rows of B)

Note:

$$\textcircled{1} AB \neq BA$$

$$\textcircled{2} A(BC) = (AB)C$$

⊙ Formulae: Let, $A_{m \times n}$, $B_{p \times q}$ & $n=p$,

① The no. of scalar multiplications required to find

$$(AB)_{m \times q} = m p q$$

$$C \times B + C \times D$$

into = scalar multiplication

② The no. of additions required to find $(AB)_{m \times q}$

$$(AB)_{m \times q} = m(p-1)q$$

Gate 2M

Q. Let $P_{4 \times 2}$, $Q_{2 \times 4}$, $R_{4 \times 1}$ be matrices find min^m.
no. of multiplications required to find PQR ?

Solⁿ; we know that,

$$(PQ)R = P(QR)$$

Consider, $P(QR)$

$$QR \rightarrow Q_{2 \times 4} \cdot R_{4 \times 1} \rightarrow \text{no. of multiplications} = 2 \cdot 4 \cdot 1 = 8$$

$$P_{4 \times 2} (QR)_{2 \times 1} \Rightarrow \text{no. of multiplications} = 4 \times 2 \times 1 = 8$$

$$\begin{array}{r} \text{min}^m \text{ no. of} \\ \text{mult}^n = 16 \end{array}$$

Consider : $[(PQ)R]$

$$P_{4 \times 2} Q_{2 \times 4} \Rightarrow \text{no. of mult}^n = 4 \times 2 \times 4 = 32$$

$$(PQ)_{4 \times 4} R_{4 \times 1} \Rightarrow \text{no. of mult}^n = 4 \times 4 \times 1 = 16$$

$$\begin{array}{r} \text{max}^m \text{ no. of} \\ \text{mult}^n = 48 \end{array}$$

$$\begin{aligned} \text{min. no. of addition} &= 2 \times 3 \times 1 = 6 \\ + \quad 4 \times 1 \times 1 &= 4 \\ \hline &10 \end{aligned}$$

$$\begin{aligned} \text{max}^m \text{ no. of addition} &= 4 \times 1 \times 4 = 16 \\ + \quad 4 \times 3 \times 1 &= 12 \\ \hline &28 \end{aligned}$$

Note: The min. no. of multiplications required to get

$$PQR = 16$$

max^m no. of multiplications required to find $PQR = 48$

The min^m no. of additions required = 10

max^m no. of additions required = 28

Transpose of Matrix :

If $A = [a_{ij}]_{m \times n}$, Then $A^T = [a_{ji}]_{n \times m}$

$$\text{e.g. } A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 6 & 7 \end{bmatrix}_{3 \times 2} \Rightarrow A^T = \begin{bmatrix} 2 & 4 & 6 \\ 3 & 5 & 7 \end{bmatrix}_{2 \times 3}$$