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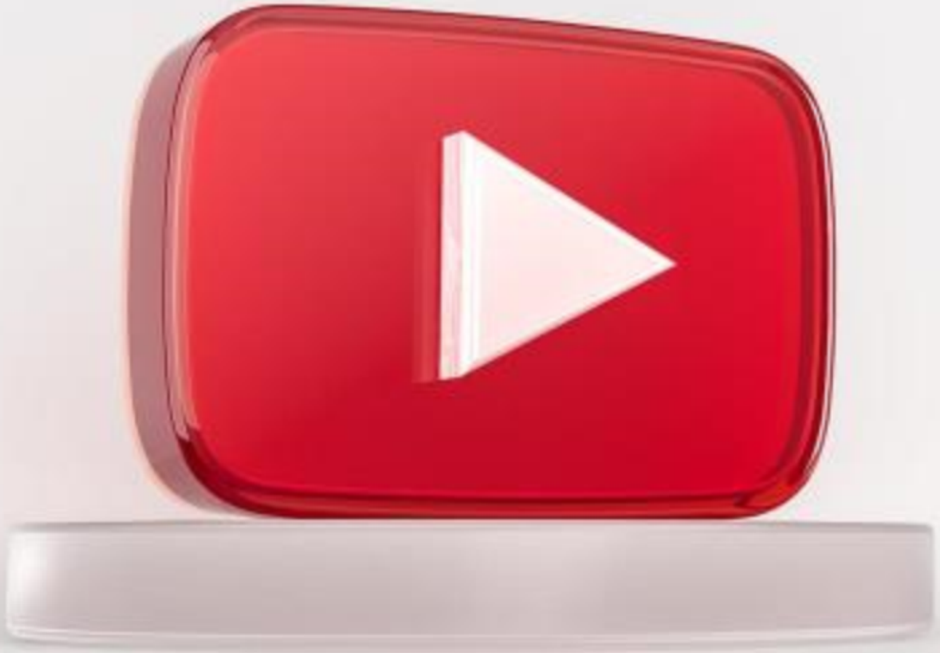

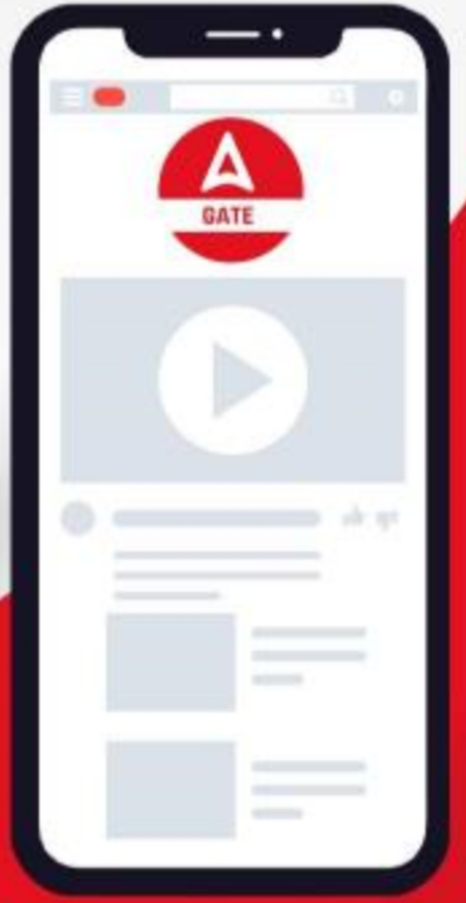

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Engineering Mathematics

Most expected questions on Linear Algebra for PSUs

MOST EXPECTED QUESTIONS

PART-1

GATE

Live@ 10:00Am

Anant sir

Q.130

Which of the following is/are the eigen vector(s) for the matrix given below?

MSQ

A. $\begin{pmatrix} -1 \\ 1 \\ 0 \\ 1 \end{pmatrix}$

B. $\begin{pmatrix} 1 \\ 0 \\ -1 \\ 0 \end{pmatrix}$

C. $\begin{pmatrix} -1 \\ 0 \\ 2 \\ 2 \end{pmatrix}$

D. $\begin{pmatrix} 0 \\ 1 \\ -3 \\ 0 \end{pmatrix}$

$A = \begin{pmatrix} -9 & -6 & -2 & -4 \\ -8 & -6 & -3 & -1 \\ 20 & 15 & 8 & 5 \\ 32 & 21 & 7 & 12 \end{pmatrix}$ 4×4

for $\lambda \Rightarrow [A - \lambda I]X = 0$

$AX = \lambda X$

$$\begin{bmatrix} -9 & -6 & -2 & -4 \\ -8 & -6 & -3 & -1 \\ 20 & 15 & 8 & 5 \\ 32 & 21 & 7 & 12 \end{bmatrix} \begin{bmatrix} -1 \\ 1 \\ 0 \\ 1 \end{bmatrix} = \lambda \begin{bmatrix} -1 \\ 1 \\ 0 \\ 1 \end{bmatrix}$$

$-9 - 6 - 4 = -\lambda$

$-19 = -\lambda \Rightarrow \lambda = 19$

$8 - 6 - 1 = 1$

$$\begin{bmatrix} -9 & -6 & -2 & -4 \\ -8 & -6 & -3 & -1 \\ 20 & 15 & 8 & 5 \\ 32 & 21 & 7 & 12 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \\ -1 \\ 0 \end{bmatrix} = \lambda \begin{bmatrix} 1 \\ 0 \\ -1 \\ 0 \end{bmatrix}$$

$-7 = \lambda$

9

$$\begin{bmatrix} -9 & -6 & -2 & -4 \\ -8 & -6 & -3 & -1 \\ 20 & 15 & 8 & 5 \\ 32 & 21 & 7 & 12 \end{bmatrix} \begin{bmatrix} -1 \\ 0 \\ 2 \\ 2 \end{bmatrix} = n \begin{bmatrix} -1 \\ 0 \\ 2 \\ 2 \end{bmatrix}$$

$9 - 4 - 8 = -n \Rightarrow n = 3$

$8 - 6 - 2 = 0$

$-20 + 16 + 10 = 6$

$-32 + 14 + 24 = -6$

$$\begin{bmatrix} -9 & -6 & -2 & -4 \\ -8 & -6 & -3 & -1 \\ 20 & 15 & 8 & 5 \\ 32 & 21 & 7 & 12 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \\ -3 \\ 0 \end{bmatrix} = n \begin{bmatrix} 0 \\ 1 \\ -3 \\ 0 \end{bmatrix}$$

$-6 + 6 = n(0)$

$-6 + 9 = n \Rightarrow n = 3$

$15 - 24 = -9$

$21 - 21$

Q.139

If $A = \begin{pmatrix} x & y & z \\ 2x & y & 3z \\ \frac{x}{2} & \frac{y}{2} & \frac{z}{2} \end{pmatrix}_{3\times3}$, then $|A| =$ _____.

(A) $10xyz$

(B) 1

(C) 0

(D) $\frac{1}{2}(x^3+y^3+z^3-3xyz)$

$R_3 \leftarrow R_3 - \frac{R_1}{2}$

$\begin{bmatrix} x & y & z \\ 2x & y & 3z \\ 0 & 0 & 0 \end{bmatrix}$

$|A| = x\left(\frac{yz}{2} - \frac{3}{2}yz\right) - y\left(xz - \frac{3}{2}xz\right) + z\left(xy - \frac{xy}{2}\right)$

$= -xyz + \frac{xzy}{2} + \frac{xyz}{2}$

$|A| = 0$

Q.140

The matrix $A = \begin{bmatrix} 4 & 3 \\ 9 & -2 \end{bmatrix}$ has eigenvalues -5 and 7.

The eigenvector(s) is/are _____

(A)	$\begin{bmatrix} 1 \\ 1 \end{bmatrix}$
(B)	$\begin{bmatrix} 3 \\ 4 \end{bmatrix}$
(C)	$\begin{bmatrix} 2 \\ -6 \end{bmatrix}$
(D)	$\begin{bmatrix} 2 \\ 8 \end{bmatrix}$

$\lambda = -5$

$\begin{bmatrix} 9 & 3 \\ 9 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$

$9x_1 = -3x_2 \Rightarrow x_2 = -3x_1$

for $\lambda = 7$

$\begin{bmatrix} -3 & 3 \\ 9 & -9 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = 0$

$3x_1 = 3x_2$

$x_1 = x_2$

Q:141

If the trace of the matrix $\begin{pmatrix} 1 & a_{12} & \cdots & a_{1n} \\ a_{21} & 2 & \cdots & a_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ a_{n1} & a_{n2} & \cdots & n \end{pmatrix}_{n \times n}$ is 55

then the value of n is

(A) 10
(B) 11
(C) 9
(D) Cannot be determined

Trace $= 1+2+3+4+\cdots+n = 55$

$\frac{n(n+1)}{2} = 55 \Rightarrow n(n+1) = 110$

$n^2+n-110=0$

Consider the following statements about two square matrices A and B of the same order:

P: $(A+B)^2 = A^2 + 2AB + B^2$

Q: $(A+B)(A-B) = A^2 - B^2$

Then,

(A) both P and Q are true.

(B) both P and Q are false

(C) both P and Q are true if A and B commute

(D) P is true but Q is false.

Q:142

$(A+B)^2 = (A+B)(A+B)$

$= A^2 + AB + BA + B^2$

$AB \neq BA$

if $AB = BA$

$(A+B)(A-B) = A^2 - AB + BA - B^2$

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GATE 2024-25	ELECTRICAL MACHINE	7:30 PM	SANTAN SIR
GATE 2024-25	COMMUNICATION	9:00 PM	RENU SIR

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ALL PSUs	GEOTECHNICAL	1:00 PM	RUDRA SIR
GATE 2024-25	STEEL STRUCTURE	6.00 PM	REHAN SIR
GATE 2024-25	ENVIRONMENT	8:00 PM	PRATIK SIR
GATE 2024-25	SOM	9:00 PM	MUKESH SIR

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ALL PSUs	THERMODYNAMICS	3:00 PM	KANISTH SIR
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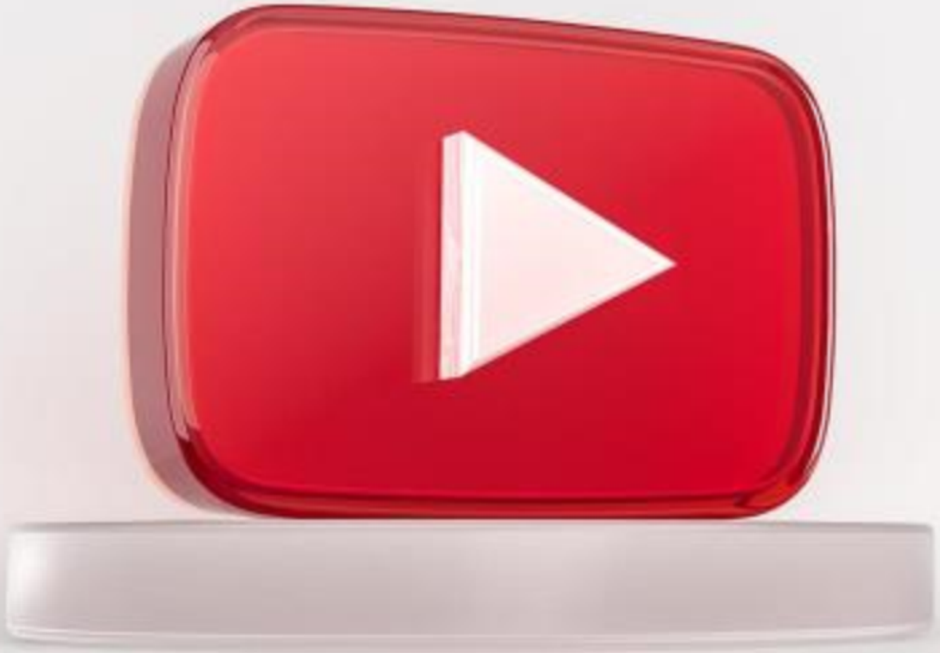

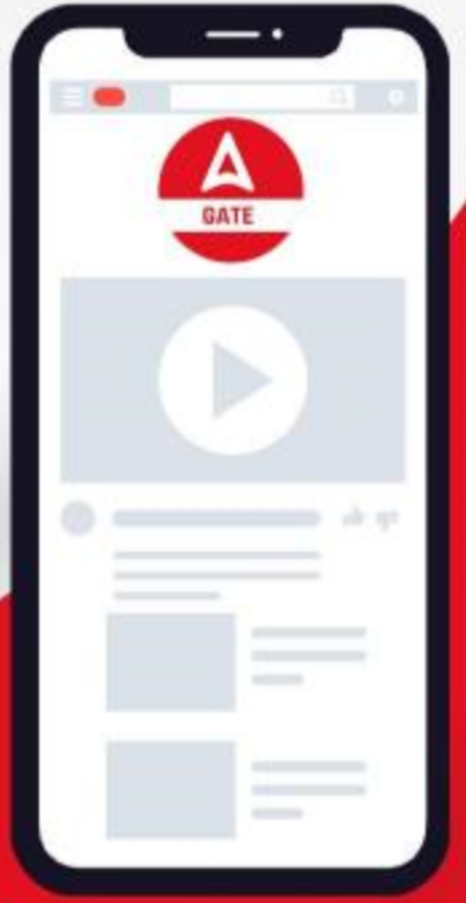

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