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# YouTube Classes Schedule

ENGINEERS

## EE & EC ENGINEERING

| EXAM TARGET | SUBJECT | TIME | FACULTY |
|---|---|---|---|
| ALL PSUs | ENGINEERING MATHS | 10:00 AM | ANANT SIR |
| GATE 2024-25 | NETWORK THEORY | 6:00 PM | RAVI SIR |
| GATE 2024-25 | ELECTRICAL MACHINE | 7:30 PM | SANTAN SIR |
| GATE 2024-25 | COMMUNICATION | 9:00 PM | RENU SIR |

# YouTube Classes Schedule

## CIVIL ENGINEERING

| EXAM TARGET | SUBJECT | TIME | FACULTY |
|---|---|---|---|
| ALL PSUs | ENGINEERING MATHS | 10:00 AM | ANANT SIR |
| 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 |

# YouTube Classes Schedule

ENGINEERS

## MECHANICAL ENGINEERING

| EXAM TARGET | SUBJECT | TIME | FACULTY |
|---|---|---|---|
| ALL PSUs | ENGINEERING MATHS | 10:00 AM | ANANT SIR |
| ALL PSUs | PRODUCTION | 11:30 PM | GAURAV SIR |
| ALL PSUs | THERMODYNAMICS | 3:00 PM | KANISTH SIR |
| GATE 2024-25 | HMT | 4:30 PM | YOGESH SIR |
| GATE 2024-25 | SOM | 9:00 PM | MUKESH SIR |


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# FREE APP
## CLASS SCHEDULE

**MECHANICAL ENGINEERING**

GATE

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|---|---|---|
| HMT | MONDAY Live @11AM | YOGESH SIR |
| PRODUCTION | TUESDAY Live @11AM | GAURAV SIR |
| SOM | WEDNESDAY Live @8PM | MUKESH SIR |
| THERMODYNAMICS | THURSDAY Live @11AM | KANISTH SIR |
| ENGINEERING MATHEMATICS | FRIDAY Live @11AM | ANANT SIR |

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| NETWORK THEORY | SATURDAY Live @11AM | RAVI SIR |
| COMMUNICATION | WEDNESDAY Live @8PM | RENU SIR |
| ANALOG ELECTRONICS | THURSDAY Live @8PM | LAWRENCE SIR |
| ENGINEERING MATHEMATICS | FRIDAY Live @11AM | ANANT SIR |
| ELECTRICAL MACHINE | MONDAY Live @8PM | SANTAN SIR |

# FREE APP CLASS SCHEDULE

## CIVIL ENGINEERING

GATE

| | | |
|---|---|---|
| SOM | WEDNESDAY Live @8PM | MUKESH SIR |
| ENVIRONMENT | THURSDAY Live @8PM | PRATIK SIR |
| STEEL STRUCTURE | FRIDAY Live @8PM | REHAN SIR |
| GEOTECHNICAL | SATURDAY Live @11AM | RUDRA SIR |
| ENGINEERING MATHEMATICS | FRIDAY Live @11AM | ANANT SIR |

Q:161

The highest Eigen value of 2×2 matrix $\begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}_{2\times 2}$ is

(a) –1 (b) –5

(c) 5 (d) 1

[ESE-2021]

$\lambda_1 + \lambda_2 = 4$

$\lambda_1 \times \lambda_2 = -5$

$+5, -1$

## Q:162

For the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ the expression

$A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$

is equivalent to

(a) $A^2 + A + 5I$ (b) $A + 5I$

(c) $A^2 + 5I$ (d) $A^2 + 2A + 6I$

[ESE-2020]

$|A - \lambda I| = 0$

$\begin{vmatrix} 1-\lambda & 4 \\ 2 & 3-\lambda \end{vmatrix} = 0$

$\lambda^2 - 4\lambda + 3 - 8 = 0$

$\lambda^2 - 4\lambda - 5 = 0$

$A^2 - 4A - 5I = 0$

$A^5 - 4A^4 - 5A^3 - 2A^3 + 11A^2 - A - 10I$

$A^3(\underbrace{A^2 - 4A - 5I}_{0}) - 2A^3 + 11A^2 - A - 10I$

$-A^3 - A^3 + 4A^2 + 7A^2 + 5A - 6A - 10I = 0$

$-A^3 + 7A^2 - 6A - 10I$

$$-A^3+7A^2-6A-10I$$

$$-A^3+4A^2+3A^2+5A-11A-10I$$

$$-A(A^2-4A-5I)+3A^2-11A-10I$$

$$3A^2-11A-10I$$

$$2A^2+A^2-4A-7A-5I-5I$$

$$2A^2-7A-5I$$

$$A^2+A^2-4A-3A-5I$$

$$A^2-3A \Rightarrow A^2-4A+A-5I+5I$$

$$A+5I$$

Q:163

The lowest Eigen value of the 2×2 matrix $\begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$ 2×2

is

(a) 1 (b) 2

(c) 3 (d) 5

[ESE-2019]

$\lambda_1 + \lambda_2 = 7$

$\lambda_1 \times \lambda_2 = 10$

$\lambda_1 = 5$

$\lambda_2 = 2$

Q:164 Let I be a 100 dimensional identity matrix and E be the set of its distinct (no value appears more than once in E) real eigenvalues. The number of elements in E is ___1___.

[GATE-2020 ME SET-II]

$$I_{100\times 100} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & \cdots \\ 0 & 1 & 0 & 0 & \cdots & \\ 0 & 0 & 1 & \cdots & & \\ \vdots & & & & & \\ \vdots & & & & & \end{bmatrix}$$

$$\lambda_1 = \lambda_2 = \lambda_3 \cdots \quad \lambda_{100} = 1$$

$$E = \{1\}$$

## Q:165

Let $A = \begin{bmatrix} 1 & 0 & -1 \\ -1 & 2 & 0 \\ 0 & 0 & -2 \end{bmatrix}$ and $B = A^3 - A^2 - 4A + 5I$,

where I is the 3 × 3 identity matrix. The determinant of B is ___1___ (up to 1 decimal place)

$B_{3\times 3} \longrightarrow \mu_1, \mu_2, \mu_3$

$$\begin{vmatrix} 1-\lambda & 0 & -1 \\ -1 & 2-\lambda & 0 \\ 0 & 0 & -2-\lambda \end{vmatrix} = 0$$

$|A| = \lambda_1 \times \lambda_2 \times \lambda_3$

$B = f(A)$

$|B| = \mu_1 \times \mu_2 \times \mu_3$

$\mu_1 = f(\lambda_1)$

$(1-\lambda)((2-\lambda)(-2-\lambda)) = 0$

$\lambda = 1, \lambda = 2, \lambda = -2$

$\mu_1 = \lambda_1^3 - \lambda_1^2 - 4\lambda_1 + 5I$

$= 1 - 1 - 4 + 5 = 1$

$\mu_2 = 8 - 4 - 8 + 5 = 1$

$|B| = 1$

$\mu_3 = -8 - 4 + 8 + 5 = 1$

**Q:166** Let $p$ and $q$ be real numbers such that $p^2 + q^2 = 1$. The eigenvalues of the matrix $\begin{bmatrix} p & q \\ q & -p \end{bmatrix}$ are

(a) $pq$ and $-pq$

(b) 1 and 1

(c) $j$ and $-j$

(d) 1 and $-1$

$|A - \lambda I| = 0$

$\begin{vmatrix} p-\lambda & q \\ q & -p-\lambda \end{vmatrix} = 0$

$\lambda^2 - p^2 - q^2 = 0$

$\lambda^2 - (p^2 + q^2) = 0$

$\lambda^2 - 1 = 0$

$\lambda^2 = 1$

$\lambda = \pm 1$

**Q:167**

A real $2 \times 2$ non-singular matrix $A$ with repeated eigen value is given as

$$A = \begin{bmatrix} x & -3.0 \\ 3.0 & 4.0 \end{bmatrix}$$

where $x$ is a real positive number. The value of $x$ (rounded off to one decimal place) is ________.

$$\begin{vmatrix} x-\lambda & -3 \\ 3 & 4-\lambda \end{vmatrix} = 0$$

$$\lambda^2 - (4+x)\lambda + 9 = 0$$

$$(4+x)^2 - 36 = 0$$

$$x^2 + 16 + 8x - 36 = 0$$

$$x^2 + 8x - 20 = 0$$

$$x = 2$$

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

**Q:168** If the vectors X (1.0, –1.0, 2.0), Y (7.0, 3.0, $x$) and Z (2.0, 3.0, 1.0) and $R^3$ are linearly dependent, the value of $x$ is 8.

$$K_1X + K_2Y + K_3Z = 0$$

$$\begin{vmatrix} 1 & -1 & 2 \\ 7 & 3 & x \\ 2 & 3 & 1 \end{vmatrix} = 0$$

$$1(3-3x) + 1(7-2x) + 2(21-6) = 0$$

$$-5x = -40$$

$$x = 8$$

Q:169

For the matrix $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ the expression

$$A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$$

is equivalent to

(a) $A^2 + A + 5I$

(b) $A + 5I$

(c) $A^2 + 5I$

(d) $A^2 + 2A + 6I$

[ESE Prelims-2020]

**Q:170** If $\lambda$ is eigenvalues of $A$, and $A$ is idempotent matrix, then

(a) $\lambda \neq 0$

(b) $\lambda \neq 1$

(c) Either $\lambda = 0$ or $\lambda = 1$

(d) $\lambda \neq 0$ and $\lambda = 1$

[EE, ESE-2020]

$A^2 = I$

$A^2 - I = 0$

$\lambda^2 - 1 = 0$

$\lambda^2 = 1$

$\lambda = \pm 1$

$A^n = \begin{cases} I & n \text{ even} \\ A & n \text{ odd} \end{cases}$

$A^3 = A^2 \cdot A$

$A^3 = A$

$\lambda^3 = \lambda$

$\lambda^3 - \lambda = 0$

$\lambda(\lambda^2 - 1) = 0$

$\lambda = 0, \lambda = \pm 1$

Q:171 Let A be a $10 \times 10$ matrix such that $A^5$ is null matrix, and let $I$ be the $10 \times 10$ identity matrix. The determinant of $A + I$ is ___1___ .

[EE, GATE-2021 : 1 mark]

$B = A + I$

$A^5 = 0$

$\lambda^5 = 0$

$\lambda = 0$

$|A + I| =$ multiplication of eigen values of 'B'

$B = 1, 1, \ldots$

$|B| = 1 \times 1 \times \ldots$

Q:172

Consider the matrix $M = \begin{bmatrix} 1 & -1 & 0 \\ 1 & -2 & 1 \\ 0 & -1 & 1 \end{bmatrix}$. One of the eigen vectors of $M$ is

(a) $\begin{bmatrix} -1 \\ 1 \\ -1 \end{bmatrix}$

(b) $\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

(c) $\begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$

(d) $\begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix}$

$$\begin{vmatrix} 1-\lambda & -1 & 0 \\ 1 & -2-\lambda & 1 \\ 0 & -1 & 1-\lambda \end{vmatrix} = 0$$

$$(1-\lambda)(\lambda^2+\lambda-1) + (1-\lambda) = 0$$

$$(1-\lambda)[\lambda^2+\lambda-1) = 0$$

$$\lambda = 1, \quad \lambda^2+\lambda-1 = 0$$

$$\lambda = \frac{-1 \pm \sqrt{1+4}}{2} = \frac{-1 \pm \sqrt{5}}{2}$$

for $\lambda = 1$

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

$$\begin{bmatrix} 0 & -1 & 0 \\ 1 & -3 & 1 \\ 0 & -1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = 0$$

$-x_2 = 0$

$AX = \lambda X$

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

$-2 = -\lambda \Rightarrow \lambda = 2$

$-1 - 2 - 1 = \lambda \quad \alpha$

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

$\lambda = 0$

$\lambda = 0$

## Q:173

A set of linear equations is given in the form $Ax = b$, where $A$ is a $2 \times 4$ matrix with real number entries and $b \neq 0$. Will it be possible to solve for $x$ and obtain a unique solution by multiplying both left and right sides of the equation by $A^T$ (the super script T denotes the transpose and inverting the matrix $A^TA$? Answer is _____.

(a) Yes, can obtain a unique solution provided the matrix $A$ is will conditioned.

(b) Yes, it is always possible to get a unique solution for any $2 \times 4$ matrix A.

(c) Yes, can obtain a unique solution provided the matrix $A^TA$ is well conditional.

(d) No, it is not possible to get a unique solution for any $2 \times 4$ matrix $A$.

$$A_{2\times4} X = B$$

$$\begin{bmatrix} - & - & - & - \\ - & - & - & - \end{bmatrix} \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = B$$

$$A_{2\times4}\, x_{4\times1} = B_{2\times1}$$

$$A^T_{4\times2}\, A_{2\times4}\, x_{4\times1} = A^T_{4\times2}\, B_{2\times1}$$

let $C = A^TA$

$$C_{4\times4}\, x = D$$

$$C = A^T A$$

$$\rho(C) = \rho(A^T A) = \rho(A) = \rho(A^T) = 2$$

THANKS FOR

# Watching

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