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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

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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

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MECHANICAL ENGINEERING

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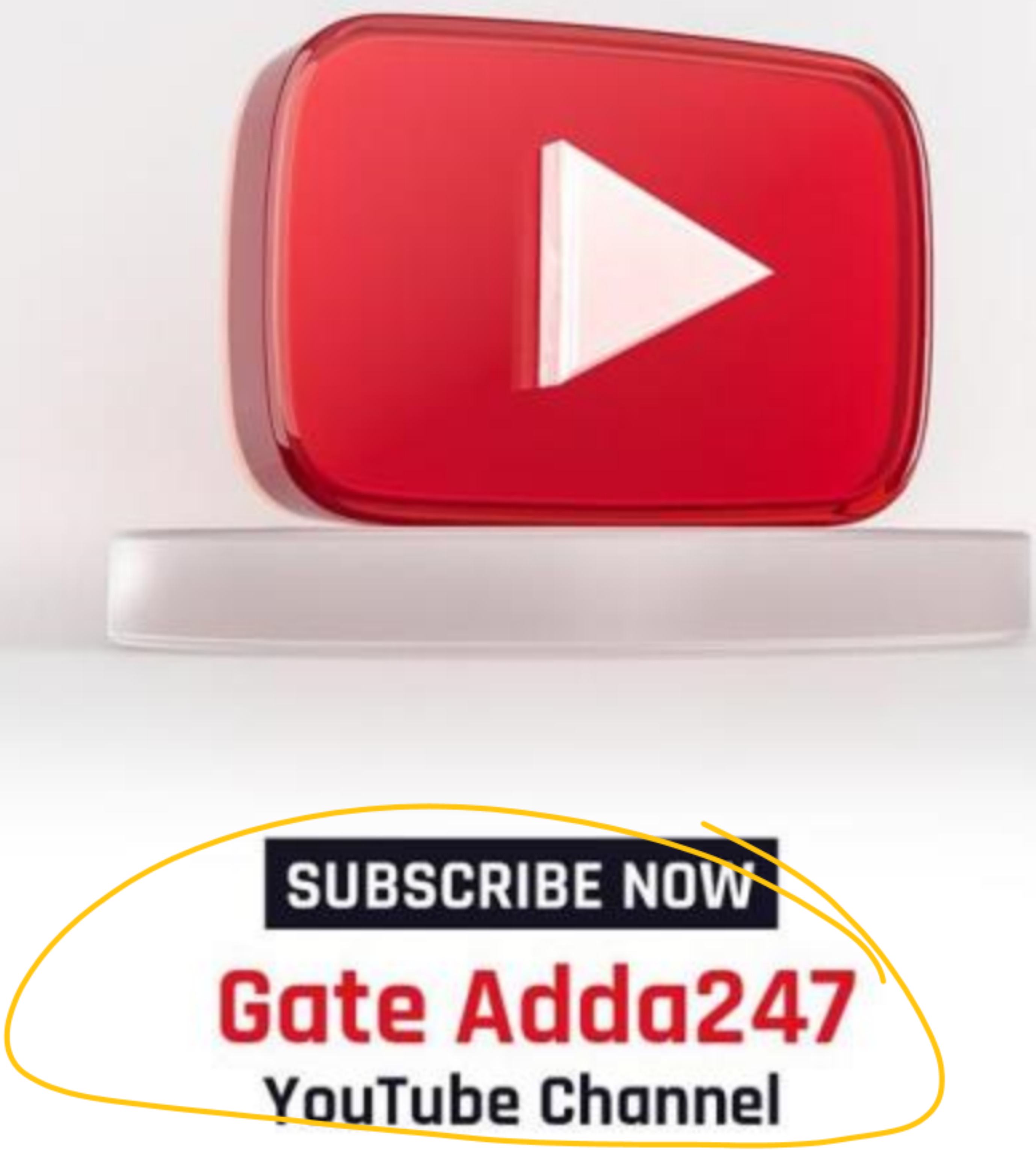
ALL PSUs	ENGINEERING MATHS	10:00 AM	ANANT SIR
ALL PSUs	PRODUCTION	11:30 PM	GAURAV SIR
ALL PSUs	THERMODYNAMICS	3:00 PM	KANISTH SIR
GATE 2024-25	HMT	4:30 PM	YOGESH SIR
GATE 2024-25	SOM	9:00 PM	MUKESH SIR



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MECHANICAL ENGINEERING

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Prachand

HMT	MONDAY Live @11AM	YOGESH SIR
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SOM	WEDNESDAY Live @8PM	MUKESH SIR
THERMODYNAMICS	THURSDAY Live @11AM	KANISTH SIR
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STEEL STRUCTURE	FRIDAY Live @8PM	REHAN SIR
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Q:39 Given the following statements about a function $f : R \rightarrow R$, select the right option:

P : If f(x) is continuous at $x = x_0$, then it is differential at $x = x_0$.

Q: If f(x) is continuous at $x = x_0$, then it may not be differentiable at $x = x_0$.

R : If f(x) is differentiable at $x = x_0$, then it is also continuous at $x = x_0$.

Q:40 The function $f(x) = x \sin x$ satisfies the following equation: $f''(x) + f(x) + t \cos x = 0$. The value of t is ________.

Sol. $f(x) = x \sin x$

$f''(x) + f(x) + t \cos x = 0$

$f(x) = x \sin x$

$f'(x) = x \cos x + \sin x$

$f''(x) = -x \sin x + \cos x + \cos x = -x \sin x + 2\cos x$

$-x \sin x + 2\cos x + x \sin x + t \cos x = 0$

$t \cos x = -2\cos x \Rightarrow t = -2$

Q:41 If a function is continuous at a point,

(a) the limit of the function may not exist at the point.

(b) the function must be derivable at the point.

(c) the limit of the function at the point tends to infinity.

(d) the limit must exist at the point and the value of limit should be same as the value of the function at that point.

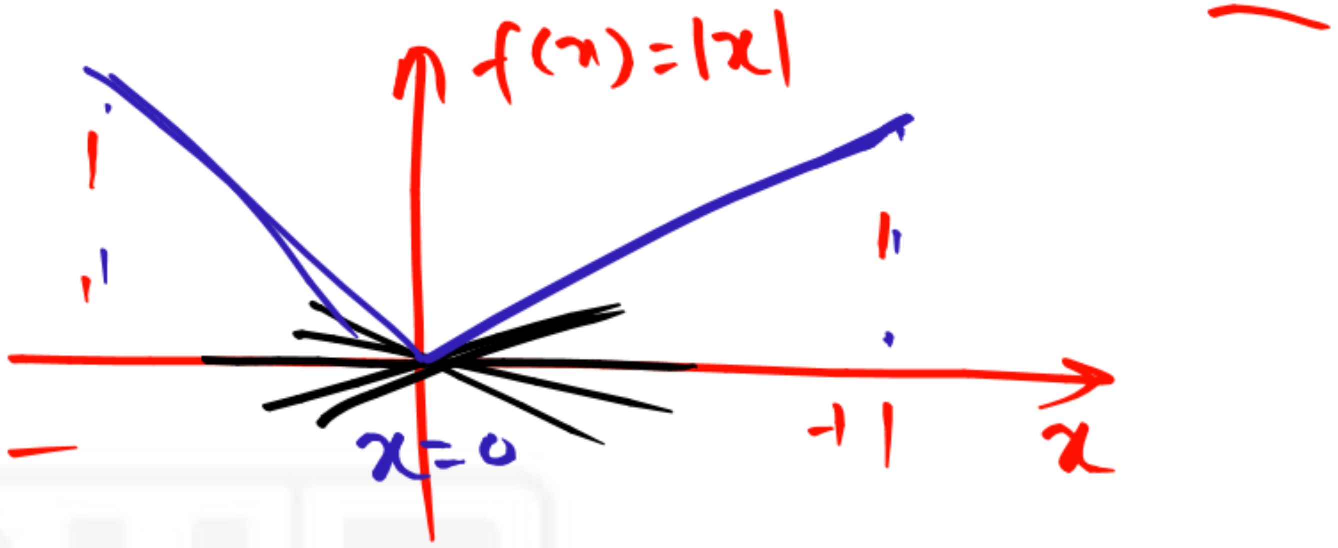
Q:42 Consider the function $f(x) = |x|$ in the interval $-1 < x \leq 1$. At the point $x = 0$, $f(x)$ is

(a) continuous and differentiable

(b) non continuous and differentiable

(c) continuous and non-differentiable

(d) neither continuous nor differentiable



Imp $f(x) = |x| = \begin{cases} x & ; 0 \leq x < 1 \\ -x & ; -1 \leq x < 0 \end{cases}$

L.H.L. $= \lim_{x \to 0^-} f(x) = -0$

R.H.L. $= \lim_{x \to 0^+} f(x) = 0$

$f(0) = 0$

L.H.D. $= \lim_{x \to 0^-} f'(x) = -1$

R.H.D. $= \lim_{x \to 0^+} f'(x) = 1$

L.H.D. $\neq$ R.H.D.

Q:43 What should be the value of λ such that the function defined below is continuous at $x = \pi/2$?

$$f(x) = \begin{cases} \dfrac{\lambda \cos x}{\frac{\pi}{2} - x} & \text{if } x \neq \pi/2 \\ 1 & \text{if } x = \pi/2 \end{cases}$$

(a) 0

(b) $2/\pi$

(c) 1

(d) $\pi/2$

for function to be continuous at $x = \frac{\pi}{2}$

$$\lim_{x \to \frac{\pi}{2}^-} f(x) = \lim_{x \to \frac{\pi}{2}^+} f(x) = f\left(x = \frac{\pi}{2}\right)$$

$$\lim_{x \to \frac{\pi}{2}} \frac{\lambda \cos x}{\frac{\pi}{2} - x} = 1$$

'0/0' for

$$\lim_{x \to \frac{\pi}{2}} \frac{+\lambda \sin x}{+1} = 1 \Rightarrow \lambda = 1$$

Q:44 The function $y = |2 - 3x|$

(a) is continuous $\forall$ x$\in$ R and differentiable $\forall$ x$\in$ R

(b) is continuous $\forall$ x$\in$ R and differentiable $\forall$ x$\in$ R except at x = 3/2

(c) is continuous $\forall$ x$\in$ R and differentiable $\forall$ x$\in$ R except at x = 2/3

(d) is continuous $\forall$ x$\in$ R except x = 3 and differentiable $\forall$ x$\in$ R

$= \begin{cases} (2-3x) & ; 2-3x \geq 0 \Rightarrow x \leq \frac{2}{3} \\ -(2-3x) & ; 2-3x < 0 \Rightarrow x > \frac{2}{3} \end{cases}$

for $x \neq \frac{2}{3}$ as fn is algebric polynomial but it is both continuous & differential.

at $x = \frac{2}{3}$

$f(\frac{2}{3}) = 0$

L.H.L. = $\lim_{x \to \frac{2}{3}^-} f(x) = 0$

R.H.L. = $\lim_{x \to \frac{2}{3}^+} f(x) = 0$

L.H.D. = $\lim_{x \to \frac{2}{3}^-} f'(x) = -3$

R.H.D. = $\lim_{x \to \frac{2}{3}^+} f'(x) = +3$

L.H.D. $\neq$ R.H.D.

Q:45 Consider the function $f(x)=|x^3|$, where x is real. then the function f(x) at x = 0 is

(a) continuous but not differentiable

(b) once differentiable but not twice

(c) twice differentiable but not thrice

(d) three differentiable

$$f(x)=\begin{cases} x^3 & ; x^3 \ge 0 \Rightarrow x \ge 0 \\ -x^3 & ; x^3 < 0 \Rightarrow x < 0 \end{cases}$$

at $x=0$

L.H.L. = −0

R.H.L. = 0

L.H.D. = 0

R.H.D. = 0

$\lim_{x\to 0^-} f''(x) = 0$

$\lim_{x\to 0^+} f''(x) = 0$

$\lim_{x\to 0^-} f'''(x) = -6$

$\lim_{x\to 0^+} f'''(x) = 6$

Q:46 Which one of the following functions is continuous at $x = 3$?

(a) $f(x) = \begin{cases} 2, & \text{if } x = 3 \\ x - 1, & \text{if } x > 3 \\ \frac{x+3}{3}, & \text{if } x < 3 \end{cases}$

f(x=3) = 2
L.H.L. = 2
R.H.L. = 2

(b) $f(x) = \begin{cases} 4, & \text{if } x = 3 \\ 8 - x & \text{if } x \neq 3 \end{cases}$

f(x=3) = 4
L.H.L. = R.H.L. = 8-3 = 5

(c) $f(x) = \begin{cases} x + 3, & \text{if } x \leq 3 \\ x - 4 & \text{if } x > 3 \end{cases}$

L.H.L. = 6
R.H.L. = 3-4 = -1

(d) $f(x) = \frac{1}{x^3 - 27}$, if $x \neq 3$

function is not defined at x=3
→ Not continuous

Q:47 The values of x for which the function $f(x) = \frac{x^2-3x-4}{x^2+3x-4}$ is NOT continuous are

(a) 4 and –1

(b) 4 and 1

(c) –4 and 1

(d) –4 and –1

$x^2+3x-4=0$

$x^2+4x-x-4=0$

$(x+4)(x-1)=0$

$x=-4, 1$

$x = \frac{-3 \pm \sqrt{9+16}}{2} = \frac{-3 \pm \sqrt{25}}{2}$

$= 1, -4$

Q:48

While minimizing the function f(x), necessary and sufficient conditions for a point x_0 to be minima are

(a) $f'(x_0) > 0$ and $f''(x_0) = 0$

(b) $f'(x_0) < 0$ and $f''(x_0) = 0$

(c) $f'(x_0) = 0$ and $f''(x_0) < 0$

(d) $f'(x_0) = 0$ and $f''(x_0) > 0$

Q:49 At $x = 0$, the function $f(x) = |x|$ has -

(a) a minimum

(b) a maximum

(c) a point of inflection

(d) neither a maximum nor minimum

Q:50 The function $f(x) = 2x - x^2 + 3$ has -

(a) a maxima at $x = 1$ and a minima at $x = 5$

(b) a maxima at $x = 1$ and a minima at $x = -5$

(c) only a maxima at $x = 1$

(d) only a minima at $x = 1$

Q:51

If the sum of the diagonal elements of a 2 × 2 symmetric matrix is - 6, then the maximum possible value of determinant of the matrix is ____________.

THANKS FOR

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