Question: Q8 1. Name the performance specification for first-order system...

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Q8

1. Name the performance specification for first-order systems.
2. What does the performance specification for a first-order system tell us?
3. In a system with an input and an output, what poles generate the steady-state response?
4. In a system with an input and an output, what poles generate the transient response?
5. The imaginary part of a pole generates what part of a response?
6. The real part of a pole generates what part of a response?
7. What is the difference between the natural frequency and the damped frequency of oscillation?
8. List five specifications for a second-order underdamped system.

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Expert Answer

Jagadeesh answered this
763 answers

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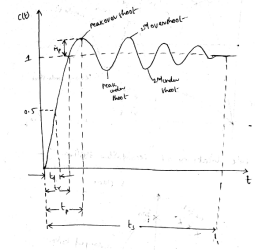

1. Delay time (t_d) :— The time required for the response to reach the 50% of its final value

$$t_d = \frac{1+0.7\,\xi}{\omega_n}$$

2. Rise time (t_r) :— It is time required for response rise from 10% to 90% of its final value for overdamped system ∞

The time taken for response to rise from 0 to 100 of its final for underdamped system

→ 5% to 95% for critically damped system

$$t_r = \frac{\pi - \beta}{\omega_d} \qquad \beta = \cos^{-1}(\xi)$$

3. Peak time (t_p) :— It is the time required for the response to reach peak of the time response

$$t_p = \frac{\pi}{\omega_d} \qquad \omega_d = \omega_n\sqrt{1-\xi^2}$$

→ Time for peak over shoot = π/ω_d

→ time for 3rd undershoot = $2\pi/\omega_d$

→ time for 2nd overshoot = $3\pi/\omega_d$ ...

4. Peak over shoot(M_p) :—

Peak over shoot (M_p) = $c(t_p) - c(\infty)$

% peak over shoot = $\frac{c(t_p) - c(\infty)}{c(\infty)} \times 100\%$

$= e^{-\xi\pi/\sqrt{1-\xi^2}} \times 100$

% of overshoot (or) undershoot = $e^{-n\pi\xi/\sqrt{1-\xi^2}} \times 100$

n = 1, 3, 5 ... overshoot

n = 2, 4, 6 ... undershoot

5) Settling time (t_s) :— It is the time taken by the response to settle with in specified error tolerance band of its final value.

*) ± 0% band $t_s = \infty$ = $\frac{5}{\xi\omega_n}$

*) ± 2% band $t_s = 4\tau$ = $\frac{4}{\xi\omega_n}$

*) ± 5% band $t_s = 3\tau$ = $\frac{3}{\xi\omega_n}$

Comment

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Q: 2. Time Response I. Name the performance specification for first-order systems 2. What does the performance specification for a first-order system tell us? 3. In a system with an input and an output, what poles generate the steady-state response? 4. In a system with an input and an output, what poles generate the transient response? 5. The imaginary part of a pole generates what...

A: See answer 100% (1 rating)

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A: See answer 100% (8 ratings)

Up next for you in Electrical Engineering

Hello, I am having trouble solving number 34. Could you please help? Thank you.

See answer

For the unit step responses shown below, find the transfer function of the system

See answer

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Q: 1. Name the performance specification for first-order systems 2. What does the performance specification for a first-order system tell us? 3. In a system with an input and an output, what poles generate the steady-state response? 4. In a system with an input and an output, what poles generate the transient response? 5. The imaginary part of a pole generates what part of a response...

A: See answer 100% (8 ratings)

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A: See answer 100% (1 rating)

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Question: Determine the Laplace transform (Y(s)) for the solution of the di...

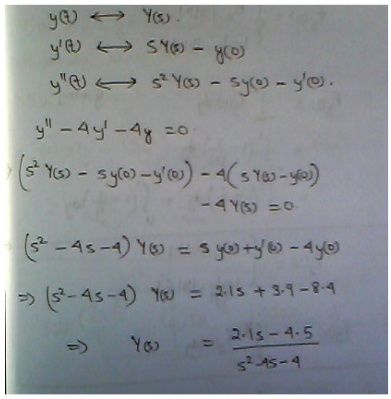
Determine the Laplace transform (Y(s)) for the solution of the differential equation given below:

y"-4y'-4y=0 Initial Conditions: y(0)=2.1, y'(0)=3.9

Expert Answer

harsukh answered this
1,771 answers

Was this answer helpful? 1 0



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Practice with similar questions

Q: Determine the Laplace tranform (Y(s)) for the solution of the differential equation given below: y"+3y'+2y=μ3(t) Initial Conditions: y(0)=0, y'(0)=0

A: See answer 100% (1 rating)

Up next for you in Advanced Math

EE235 Find the Fourier Series and Fourier Expansion (up to n=4) of the following: (a) f(x) HAY -{3-v } 5 (b) f(x)= -3<x< 0 0<x<3

See answer

See more questions for subjects you study

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Q: 5. (20) Find the work done by the force F = 4xyi + (2x2 – 3xy); by pushing a particle along the line segment from (-3,-2) to (1,0) and the arc of the circle in the first quadrant from (1,0) to (0,1).

A: See answer