


Find solutions for your homework

Search

home / study / engineering / mechanical engineering / mechanical engineering questions and answers / for each of the transfer functions shown below...

Question: For each of the transfer functions shown below, find the locatio...

(3 bookmarks) | 

For each of the transfer functions shown below, find the locations of the poles and zeros, plot them on the s-plane, and then write an expression for the general form of the step response without solving for the inverse Laplace transform. State the nature of each response (overdamped, underdamped, and so on).

6. For each of the transfer functions shown below, find the locations of the poles and zeros, plot them on the s-plane, and then write an expression for the general form of the step response without solving for the inverse Laplace transform. State the nature of each response (overdamped, underdamped, and so on). [[Sections: 4.3, 4.4](#)]



- a. $T(s) = \frac{2}{s+2}$
- b. $T(s) = \frac{5}{(s+3)(s+6)}$
- c. $T(s) = \frac{10(s+7)}{(s+10)(s+20)}$
- d. $T(s) = \frac{20}{s^2+6s+144}$
- e. $T(s) = \frac{s+2}{s^2+9}$
- f. $T(s) = \frac{(s+5)}{(s+10)^3}$

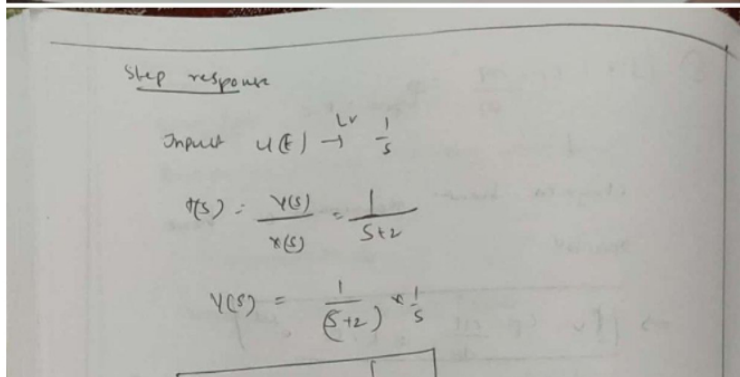
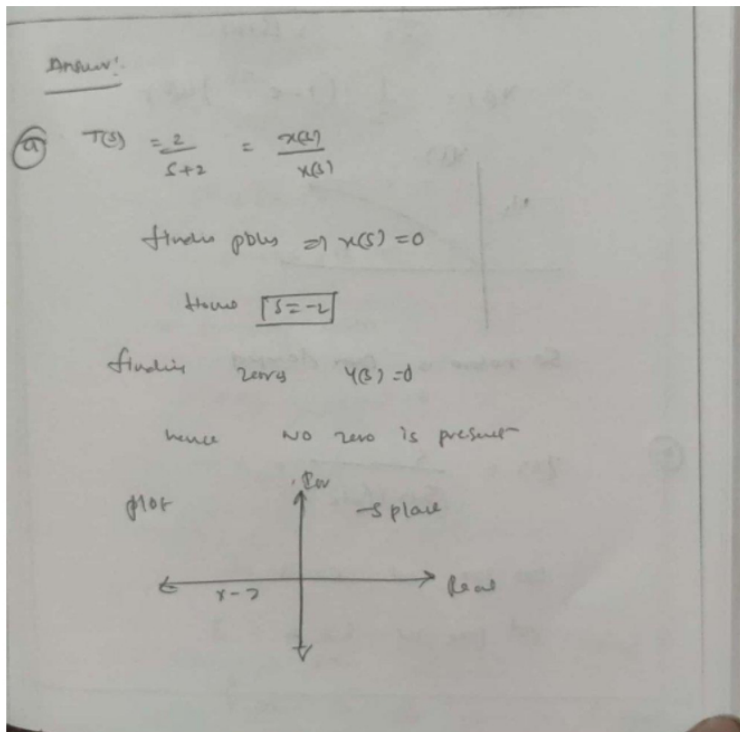
Show transcribed image text

Expert Answer



Anonymous answered this
583 answers

Was this answer helpful?  3  0



Post a question

Answers from our experts for your tough homework questions

Enter question

Continue to post

20 questions remaining



Snap a photo from your phone to post a question

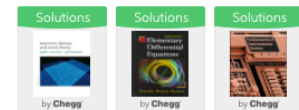
We'll send you a one-time download link

888-888-8888

Text me

By providing your phone number, you agree to receive a one-time automated text message with a link to get the app. Standard messaging rates may apply.

My Textbook Solutions



Electronic Devices and...
 11th Edition
 · (1)

Elementary Differential...
 8th Edition

Fundamental s of...
 1st Edition

View all solutions

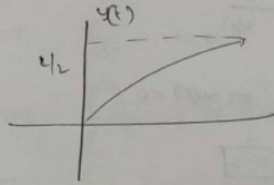
$$Y(s) = \frac{1}{s(s+2)}$$

Write as

$$Y(s) = \frac{1}{s(s+2)}$$

$$Y(s) = \frac{1}{2s} - \frac{1}{2(s+2)}$$

$$y(t) = \frac{1}{2} (1 - e^{-2t}) u(t)$$



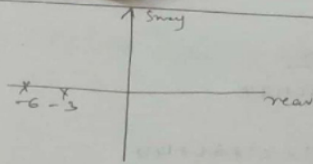
So nature is Over damped

b.

$$Y(s) = \frac{s}{(s+3)(s+6)}$$

One pole at $s = -3$

and pole at $s = -6$



Step response

$$Y(s) = \frac{s}{(s+3)(s+6)}$$

$$y(t) = u(t) \xrightarrow{LT} Y(s) = \frac{1}{s}$$

$$Y(s) = \frac{s}{(s+3)(s+6)} \times \frac{1}{s}$$

→ System Characteristic Equation

$$(s+3)(s+6) = 0$$

$$s^2 + 6s - 3s + 18 = 0$$

$$s^2 + 9s + 18 = 0$$

On comparing with

$$s^2 + 2\zeta\omega_n s + \omega_n^2 = 0$$

$$\omega_n^2 = 18$$

$$\omega_n = \sqrt{18} = 4.2426$$

$$2\zeta\omega_n = 9$$

$$\xi = \frac{\sigma}{\omega_n} = \frac{3}{2 \times 9.2426} = 1.0606$$

$\xi > 1$ is So system over damped.

(d)

$$G(s) = \frac{20}{s^2 + 6s + 144}$$

$$\text{Denominator } d(s) = s^2 + 6s + 144$$

Roots of denominator $d(s)$ is

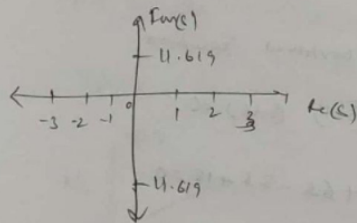
$$s = \frac{-6 \pm \sqrt{6^2 - 4(144)}}{2} = -3 \pm j11.619$$

$$s_1 = -3 + j11.619i$$

$$s_2 = -3 - j11.619i$$

$$\text{Numerator } n(s) = 20$$

\therefore No zero the transfer function



\Rightarrow we know that when poles of system are in the form of

$$s = \sigma_x \pm j\omega_x \quad \text{--- (1)}$$

If is under damped system

General form of $1/s$ step response

$$c(t) = k_1 + k_2 e^{-\sigma_x t} \cos(\omega_x t - \phi)$$

By comparing Equation (1) and (2)

$$\sigma_x = 3 \quad \omega_x = 11.619$$

$$c(t) = k_1 + k_2 e^{-3t} \cos(11.619t - \phi)$$

(e)

$$T(s) = \frac{s+2}{s^2+9}$$

$$s^2 + 9 = 0$$

$$s = \pm 3i$$

$$s_1 = 3i \quad s_2 = -3i$$

$$\text{Numerator } n(s) = s+2$$

$s+2=0$
 $s = -2$ is the zero of system

Note!
 We know the poles of the system are in the form of
 $s = -\zeta\omega \pm j\omega_d$

It is underdamped system
 General form of the step response
 $c(t) = k_1 + A \cos(\omega_d t - \phi)$
 By comparing Equation (3) and (4),

$\omega_d = 3$
 $c(t) = k_1 + A \cos(3t - \phi)$
 =====
 As per class guide lines we have to solve only 4 sub part I did (a), (b), (d), (e) hope u understand pls pls upvote thank you -
 =====

Scanned with CamScanner

pls pls pls like upvote hope u like it thank you

Comment >

Practice with similar questions

Q: Problem 3.0 For each of the transfer functions shown below, find the locations of the poles and zeros, plot them on the s-plane, and then write an expression for the general form of the step response without solving for the inverse Laplace transform. State the nature of each response (overdamped, underdamped, and so on). a. $T(s) = s + 2$ b. $T(s) =$

A: See answer 100% (1 rating)

Q: Q6 For each of the transfer functions shown below, find the locations of the poles and zeros, plot them on the s-plane, and then write an expression for the general form of the step response without solving for the inverse Laplace transform. State the nature of each response (overdamped, underdamped, and so on) 10(s + 7) c. $T(s) = T + 10 / (s + 20)$ 20 s² + 6s + 144 s + 2 (s + 10)

A: See answer

Show more v

Up next for you in Mechanical Engineering



For each of the three unit step responses shown in Figure P4.7, find the transfer function of the system. [Sec...

SS 21. for each of t function of the syste

See answer

For each of the transfer functions shown below, find the locations of the poles and zeros, plot them on the j-pla...

Problem 1

For each of the transfer functions shown below, find the locations of the poles and zeros, plot them on the s-plane, and then write an expression for the general form of the step response without solving for the inverse Laplace transform. State the nature of each response (overdamped, underdamped, and so on).
a. $T(s) = \frac{1}{s^2 + 2s}$

See answer

See more questions for subjects you study


Questions viewed by other students

Q: Please explain how to find the general form of the step response with details.

A: [See answer](#)  100% (1 rating)

Q: Problem 3.0 For each of the transfer functions shown below, find the locations of the poles and zeros, plot them on the s-plane, and then write an expression for the general form of the step response without solving for the inverse Laplace transform. State the nature of each response (overdamped, underdamped, and so on). a. $T(s) = s + 2$ b. $T(s) =$

A: [See answer](#)  100% (1 rating)

[Show more](#) 

COMPANY

About Chegg
Chegg For Good
College Marketing
Corporate Development
Investor Relations
Jobs
Join Our Affiliate Program
Media Center
Site Map

LEGAL & POLICIES

Advertising Choices
Cookie Notice
General Policies
Intellectual Property Rights
Terms of Use
Global Privacy Policy
DO NOT SELL MY INFO
Honor Code
Honor Shield

CHEGG PRODUCTS AND SERVICES

Cheap Textbooks
Chegg Coupon
Chegg Play
Chegg Study Help
College Textbooks
eTextbooks
Flashcards
Learn
Chegg Math Solver

CHEGG NETWORK

EasyBib
Internships.com
Thinkful

CUSTOMER SERVICE

Customer Service
Give Us Feedback
Help with eTextbooks
Help to use EasyBib Plus
Manage Chegg Study Subscription
Return Your Books
Textbook Return Policy

