

Unit 14 - Analogous Systems

Course outline

How to access the portal

Unit 0

Basic Circuit Elements and Waveforms

Mesh and Node Analysis

Network Theorems -1

Network Theorems -2

First Order and Second Order Circuits

Laplace Transform and its Application

Circuit Analysis Using Laplace Transform

Two Port Network

Sinusoidal Steady State Analysis - 1

Sinusoidal Steady State Analysis - 2

State Variable Analysis

Analogous Systems

Characteristic Equation, Eigenvalues, and Eigenvectors-State Variable Analysis Continued...

Modeling of Mechanical Systems

Modeling of The Rotational Motion of Mechanical Systems

Modeling of Electrical Systems

Solving Analogous Systems

Quiz : Assignment 12

Assignment 12 solution

Assignment 12

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2019-10-23, 23:59 IST.

1) For the system governed by the set of equations

2 points

$$\frac{dx_1}{dt} = 2x_1 + x_2 + u$$

$$\frac{dx_2}{dt} = -2x_1 + u$$

$$y = 3x_1$$

The transfer function $\frac{Y(s)}{U(s)}$ is :

- $\frac{3(s+1)}{s^2-2s+2}$
- $\frac{3(s+1)}{s^2+2s+2}$
- $\frac{3(s-1)}{s^2-2s+2}$
- $\frac{3(s)}{s^2-2s+2}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $\frac{3(s+1)}{s^2-2s+2}$

2) Under mechanical rotational system and electrical system, the quantities that are not analogous are

2 points

- Angular velocity and current
- Angular displacement and charge
- Viscous friction and coefficient resistance
- Moment of inertia and conductance

No, the answer is incorrect.
Score: 0

Accepted Answers:
Moment of inertia and conductance

3) Consider reciprocal of capacitance and torsional spring stiffness as analogous quantities. The system is considered as

2 points

- Torque - voltage
- Torque - current
- Force - voltage
- Force - current

No, the answer is incorrect.
Score: 0

Accepted Answers:
Torque - voltage

4) The relationship between the force $f(t)$ and the displacement $x(t)$ of a spring-mass system (with mass M , viscous damping D , and spring constant K) is

$$M \frac{d^2x(t)}{dt^2} + D \frac{dx(t)}{dt} + Kx(t) = f(t)$$

$X(s)$ and $F(s)$ are the Laplace Transform of $x(t)$ and $f(t)$ respectively. With $M=0.1$, $D=2$, $K=10$ in appropriate units, the transfer function $G(s) = \frac{X(s)}{F(s)}$ is

- $\frac{10}{s^2+20s+100}$
- $\frac{20}{s^2+20s+100}$
- $\frac{10}{s^3+20s+100}$
- $\frac{10}{s^2+10s+100}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $\frac{10}{s^2+20s+100}$

5) Force balancing equation of a mass element is (where, x = displacement)

2 points

- $M \frac{d^2x}{dt^2}$
- $M \frac{dx}{dt}$
- Mx
- Any of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $M \frac{d^2x}{dt^2}$