Prev Page Next Page

Important Short Questions, Answers: Control Systems - Systems and their Representation | Study Material, Lecturing Notes, Assignment, Reference, Wiki description explanation, brief detail

Chapter: **Control Systems - Systems and their Representation**

Important Short Questions, Answers: Control Systems - Systems and their Representation

Control Systems - Systems and their Representation - Solved Problems, Important Short Questions, Answers: Control Systems - Systems and their Representation

SYSTEMS AND THEIR REPRESENTATION

1. What is control system?

A system consists of a number of components connected together to perform a specific function . In a system when the output quantity is controlled by varying the input quantity then the system is called control system.

2. Define open loop control system.

The control system in which the output quantity has no effect upon the input quantity is called open loop control system. This means that the output is not feedback to the input for correction.

3. Define closed loop control system.

The control system in which the output has an effect upon the input quantity so as to maintain the desired output values are called closed loop control system.

4. What are the components of feedback control system?

The components of feedback control system are plant, feedback path elements, error detector actuator and controller.

5. Distinguish between open loop and closed loop system

S.No	Open Loop	Closed Loop
1	Inaccurate	Accurate
2	Simple and Economical	Complex and Costlier
3	The change in output due to external disturbance are not corrected automatically	The change in output due to external disturbance are corrected automatically
4	May oscillate and become unstable	They are generally stable

Open Loop

1. Inaccurate
2. Simple and Economical
3. The change in output due to external disturbance are not corrected
4. May oscillate and become un stable

Closed Loop

1. Accurate
2. Complex and Costlier
3. The change in output due to external disturbance are corrected automatically
4. They are generally stable

6. Define transfer function.

The Transfer function of a system is defined as the ratio of the laplace transform of output to Laplace transform of input with zero initial conditions.

7. What are the basic elements used for modeling mechanical translational system.

Mass M, Kg,

Stiffness of spring K, N/m

and Viscous friction coefficient dashpot B, N-sec/m

8. What are the basic elements used for modeling mechanical rotational system?

Moment of inertia J, Kg-m^2/rad

dashpot with rotational frictional coefficient B, N-m/(rad/sec) And torsional spring with stiffness K ,N-m /rad.

9. Name two types of electrical analogous for mechanical system.

The two types of analogies for the mechanical system are

Force voltage and

Force current analogy

10. What is block diagram?

A block diagram of a system is a pictorial representation of the functions performed by each component of the system and shows the flow of signals.

11. What are the basic components of Block diagram?

The basic elements of block diagram are blocks, branch point and summing point

12. What is the basis for framing the rules of block diagram reduction technique?

The rules for block diagram reduction technique are framed such that any modification made on the diagram does not alter the input output relation.

13. What is a signal flow graph?

A signal flow graph is a diagram that represents a set of simultaneous algebraic equations

.By taking Laplace Transform the time domain differential equations governing a control system can be transferred to a set of algebraic equations in s-domain.

14. What is transmittance?

The transmittance is the gain acquired by the signal when it travels from one node to another node in signal flow graph.

15. What is sink and source?

Source is the input node in the signal flow graph and it has only outgoing branches. Sink is a output node in the signal flow graph and it has only incoming branches.

16. Define non touching loop.

The loops are said to be non touching if they do not have common nodes.

17. Write Masons Gain formula.

Mason's gain formula states that the overall gain of the system as follows Overall gain,

T = T(S) = transfer function of the system

K= Number of forward path in the signal flow.

P_K = forward path gain of the Kth forward path

Δ = 1 - (Sum of individual loop gains) + (Sum of gain products of all possible combinations of two non touching loops)- (Sum of gain products of all possible combinations of three non touching loops) + ...

Δ_K = (Δ for that part of the graph which is not touching Kth forward path)

18. Write the analogous electrical elements in force voltage analogy for the elements of mechanical translational system.

Force, f à Voltage, e

Velocity, V à current, i

Displacement, x à charge, q

Frictional coefficient, B à Resistance, R

Mass, M à inductance, L

Stiffness, K à Inverse of capacitance 1/C

Newton's second law à Kirchhoff's voltage law.

19. Write the analogous electrical elements in force current analogy for the elements of mechanical translational system.

Force, f à current, i

Velocity, V à Voltage, e

Displacement, x à flux, Φ

Frictional coefficient, B à Conductance, G =1/ R

Mass, M à capacitance C

Stiffness, K à Inverse of inductance, 1/L

Newton's second law à Kirchhoff's current law.

20. Write the analogous electrical elements in torque voltage analogy for the elements of mechanical rotational system.

Torque, T à Voltage, e

Angular Velocity, ω à current, i

Angular Displacement, θ à charge, q

Frictional coefficient, B à Resistance, R

Moment of Inertia, J à inductance, L

Stiffness of the spring, K à Inverse of capacitance 1/C

Newton's second law à kirchhoff's voltage law.

21. Write the analogous electrical elements in torque current analogy for the elements of mechanical rotational system.

Torque, T à current, i

Angular Velocity, ω à Voltage, e

Angular Displacement, θ à flux, Φ

Frictional coefficient, B à Conductance, G =1/ R

Moment of Inertia,J à capacitance C

Stiffness of the spring, K à Inverse of inductance, 1/L

Newton's second law à kirchhoff's current law.

22. Write the force balance equation of an ideal mass, dashpot and spring element.

Let a force F be applied to an ideal mass M. The mass will offer an opposing force f_m which is proportional to acceleration.

$F \propto f_m = M\,d^2x/dt^2$

Let a force F be applied to an ideal dashpot, with viscous frictional coefficient B. The dashpot will offer an opposing force f_b which is proportional to velocity.

$F \propto f_b = B\,dx/dt$

Let a force F be applied to an ideal spring, with spring constant K. The spring will offer an opposing force f_k which is proportional to displacement.

$F \propto f_k = K\,X$

23. Why negative feedback is invariably preferred in closed loop system?

The negative feedback results in better stability in steady state and rejects any disturbance signals.

24. State the principles of homogeneity (or) superposition.

The principle of superposition and homogeneity states that if the system has responses $y_1(t)$ and $y_2(t)$ for the inputs $x_1(t)$ and $x_2(t)$ respectively then the system response to the linear combination of the individual outputs $a_1x_1(t) + a_2x_2(t)$ is given by linear combination of the individual outputs $a_1y_1(t)+a_2y_2(t)$, where a_1, a_2 are constants.

25. What are the basic properties of signal flow graph?

The basic properties of signal flow graph are

Signal flow graph is applicable to linear systems. It consists of nodes and branches.

A node adds the signal of all incoming branches and transmits this sum to all outgoing branches.

Signals travel along branches only in the marked direction and is multiplied by the gain of the branch.

The algebraic equations must be in the form of cause and effect relationship.

Prev Page Next Page

Study Material, Lecturing Notes, Assignment, Reference, Wiki description explanation, brief detail

Prev Page Next Page

Related Topics

AC Servo Motors - Control Systems
DC Servo Motor - Control Systems
Block diagram reduction Techniques - Transfer Function
Signal Flow Graph Representation
Tutorial Problems: Control Systems - Systems and their Representation
Time response
Time response analysis
Problems on Time Response Analysis
System Time Response
Steady State Error
PI PI, PD and PID Compensation
Impulse Response of a First Order System

Copyright © 2018-2021 BrainKart.com; All Rights Reserved. (BE) Developed by Therithal info, Chennai