

BIRSA INSTITUTE OF TECHNOLOGY (TRUST)

BITT POLYTECHNIC

1ST ASSIGNMENT WITH SOLUTION

BRANCH: ECE Semester- 4TH

SUB : CONTROL SYSTEM

OBJECTIVE QUESTION

1. ___ is a closed loop system.

- (a) Auto-pilot for an aircraft
- (b) Direct current generator
- (c) Car starter
- (d) Electric switch

Ans: a

2. Which of the following devices are commonly used as error detectors in instruments ?

- (a) Vernistats
- (b) Microsyns
- (c) Resolvers
- (d) Any of the above

Ans: d

3. Which of the following should be done to make an unstable system stable ?

- (a) The gain of the system should be decreased
- (b) The gain of the system should be increased
- (c) The number of poles to the loop transfer function should be increased
- (d) The number of zeros to the loop transfer function should be increased

Ans: b

4. ___ increases the steady state accuracy.

- (a) Integrator
- (b) Differentiator
- (c) Phase lead compensator
- (d) Phase lag compensator

Ans: a

5. A.C. servomotor resembles

- (a) two phase induction motor
- (b) Three phase induction motor
- (c) direct current series motor
- (d) universal motor

Ans: a

6. As a result of introduction of negative feedback which of the following will not decrease ?

- (a) Band width
- (b) Overall gain
- (c) Distortion
- (d) Instability

Ans: a

7. Regenerative feedback implies feedback with

- (a) oscillations
- (b) step input
- (c) negative sign
- (d) positive sign

Ans: d

8. The output of a feedback control system must be a function of

- (a) reference and output
- (b) reference and input
- (e) input and feedback signal
- (d) output and feedback signal

Ans: a

9. ___ is an open loop control system.

- (a) Ward Leonard control
- (b) Field controlled D.C. motor
- (c) Stroboscope
- (d) Metadyne

Ans: b

10. A control system with excessive noise, is likely to suffer from

- (a) saturation in amplifying stages
- (b) loss of gain
- (c) vibrations
- (d) oscillations

Ans: a

11. Zero initial condition for a system means

- (a) input reference signal is zero
- (b) zero stored energy
- (c) no initial movement of moving parts
- (d) system is at rest and no energy is stored in any of its components

Ans: d

12. Transfer function of a system is used to calculate which of the following ?

- (a) The order of the system
- (b) The time constant
- (c) The output for any given input
- (d) The steady state gain

Ans: c

13. The band width, in a feedback amplifier.

- (a) remains unaffected
- (b) decreases by the same amount as the gain increase
- (c) increases by the same amount as the gain decrease
- (d) decreases by the same amount as the gain decrease

Ans: c

SHORT QUESTION

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. What are the two major types of control system?

The two major types of control system are open loop and closed loop

3. 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.

4. 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 value is called closed loop control system.

5. What are the components of feedback control system?

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

6. Distinguish between open loop and closed loop system

7. 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.

8. 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 condition.

9. What are the basic elements used for modeling mechanical translational system.
Mass, spring and dashpot.

10. What are the basic elements used for modeling mechanical rotational system?
Moment of inertia J , dashpot with rotational frictional coefficient B and torsional spring with stiffness K .

11. Write the force balance equation of an ideal mass element.

$$F = M \frac{d^2 x}{dt^2}$$

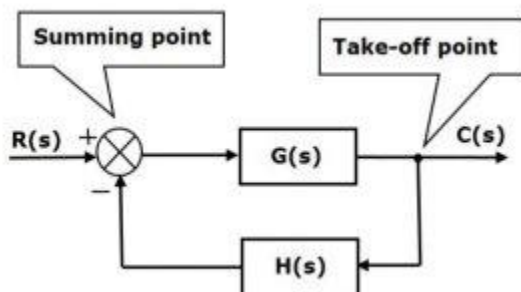
12. Write the force balance equation of ideal dashpot element.

$$F = B \frac{dx}{dt}$$

LONG QUESTION

1 Explain block diagram with its basic element?

Block diagram can be a single block or a combination of blocks that represents a control system in pictorial form.



A simple block diagram featuring two blocks, summing and takeoff points.

Advantages of block diagram:

It is easy to represent even a complicated control system in block diagram.

The flow of signals and function of each blocks can be easily understood.

Advantages of block diagram reduction technique:

It is easy to reduce the block diagram and derive the overall transfer function by following reduction rules.

Limitations:

It takes more time to reduce a big system as the reduced diagram has to be drawn at each step.

Explain Types of Control systems

Ans-

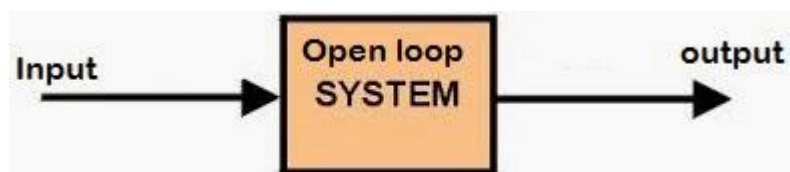
Types of Control systems:

Control systems are of two types. They are

- 1) Open Loop System
- 2) Closed Loop System

1) Open loop control system:

*Any physical system which does not automatically correct the variation in its output is called an open loop system or control system in which the output quantity has no effect upon the input quantity are called **open loop control system**. This means that the output is not feedback to the input for correction.*



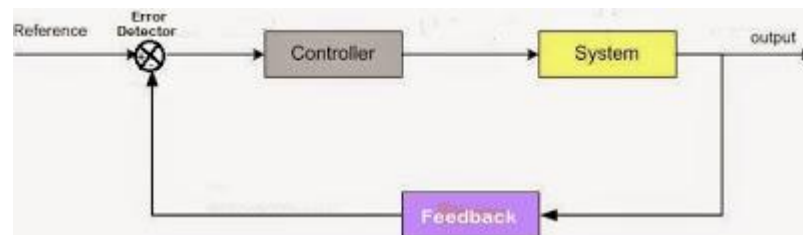
In open loop control system, the output can be varied by varying the input. But due to external disturbances, the system output may change. When the output

changes due to disturbances, it is not followed by changes in input to correct the output. In **open loop systems**, the changes in output are corrected by changing the input manually.

2) Closed loop control system:

Control systems in which the output has an effect upon the input quantity in order to maintain the desired output value are called **closed loop systems**.

The **open loop system** can be modified as closed loop system by providing a feedback. The provision of feedback automatically corrects the changes in output due to disturbances. Hence the closed loop system is also called automatic control system. The general **block diagram of an automatic control system** is shown in the figure below. It consists of an error detector, a controller, plant (open loop system) and feedback path elements.



The reference signal (or input signal) corresponds to the desired output. The feedback path elements sample the output and convert it to the same type as that of the reference signal. The feedback signal is proportional to the output signal and it is fed to the error detector. The error signal generated by the error detector is the difference between the reference signal and the feedback signal. The controller modifies and amplifies the error signal to produce better control action. The modified error signal is fed to the plant to correct its output.