16774

BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – B.Tech.(ME)-2021
Course Name – Automation & Control
Course Code - OEC-ME802B
(Semester VIII)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question)

1. *Choose the correct alternative from the following :* 1 x 15=15

(i) Classify control systems based on feedback.
a) Open-loop and closed-loop
b) Digital and analog
c) Linear and nonlinear
d) Time-invariant and time-variant

(ii) Identify the components of a block diagram.
a) Summing point
b) Gain function
c) Transfer function
d) All of the mentioned

(iii) Interpret the role of a summing point in a block diagram.
a) Multiplies signals
b) Adds or subtracts input signals
c) Filters the signal
d) Delays the signal

(iv) Identify the impact of noise in feedback systems.
a) Increases overall gain
b) Improves accuracy
c) Reduces stability
d) Amplifies disturbances

(v) Summarize the benefits of negative feedback in control systems.
a) Reduces error
b) Increases noise
c) Decreases stability
d) Enhances disturbances

(vi) Choose the process of deriving the transfer function of a feedback system.
a) Use block diagram reduction
b) Apply Laplace transform
c) Use Mason's gain formula
d) All of the mentioned

(vii) Choose the importance of Mason's Gain Formula in control systems.
a) Computes transfer function
b) Determines stability
c) Measures error response
d) Designs feedback loops

(viii) Indicate the correct phrase in context to unit impulse response of a first-order system.
a) Exponential decay
b) Constant response
c) Linear increase
d) Oscillatory response

(ix) Interpret the reason for first-order system to be unstable with a ramp input.

a) Unbounded output
b) Constant gain
c) Decaying output
d) Stable for all inputs

(x) Distinguish proportional and integral controllers.
a) Integral reduces steady-state error
b) Proportional increases error
c) Both act identically
d) Integral is only for open-loop

(xi) Determine the response for a critically damped system.
a) Fastest without overshoot
b) Slowest response
c) Maximum overshoot
d) Unstable

(xii) Identify the inverse relation between settling time and damping ratio.
a) Higher damping settles faster
b) Lower damping increases stability
c) No relationship exists
d) Higher damping increases response time

(xiii) Compute breakaway point for poles at -1 and -4.
a) -2.5
b) -3
c) -1.5
d) -4.5

(xiv) Identify the phase shift at high frequencies for a first-order system.
a) 0°
b) -90°
c) -180°
d) 90°

(xv) Select the role of initial conditions in state space modeling.
a) They define the initial state
b) They affect dynamics
c) They do not impact states
d) They have no effect

Group-B
(Short Answer Type Questions) 3 x 5=15

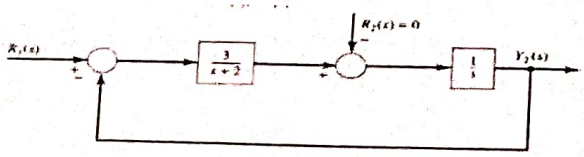
2. List the types of stability in control systems. (3)
3. Predict the number of poles in the right half of the s-plane for the equation: $s^4 + 2s^3 + 3s^2 + 4s + 5 = 0$ using Routh's criterion. (3)
4. State the standard test signals used in time response analysis. (3)
5. Classify control systems on the basis of feedback path. (3)
6. Analyze the effect of adding a zero to a root locus. (3)

OR

Analyze the use of Routh-Hurwitz over direct root solving for high-order polynomials. (3)

Group-C
(Long Answer Type Questions) 5 x 6=30

7. Infer the method of stability analysis of a control system where all elements in one row of the Routh table become zero. (5)
8. Evaluate the trasfer function for the following diagram: (5)



9. Judge the overall gain (T) of a control system that has an open-loop gain (G) of 5 and a negative feedback factor (H) of 0.2. (5)
10. List the steps for constructing a Polar plot and its relevance in control system analysis. (5)

11. Evaluate the effect of frequency response analysis method in control system design decisions. (5)

12. Compare the effect of different damping ratios on system response. (5)

OR

Explain the effect of adding poles and zeros on the Root Locus and system stability. (5)

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