

Control Systems

(Common with EX & EE)

Time : 3 Hours

Min. Passing Marks : 24

Maximum Marks : 80

Instruction to Candidates :

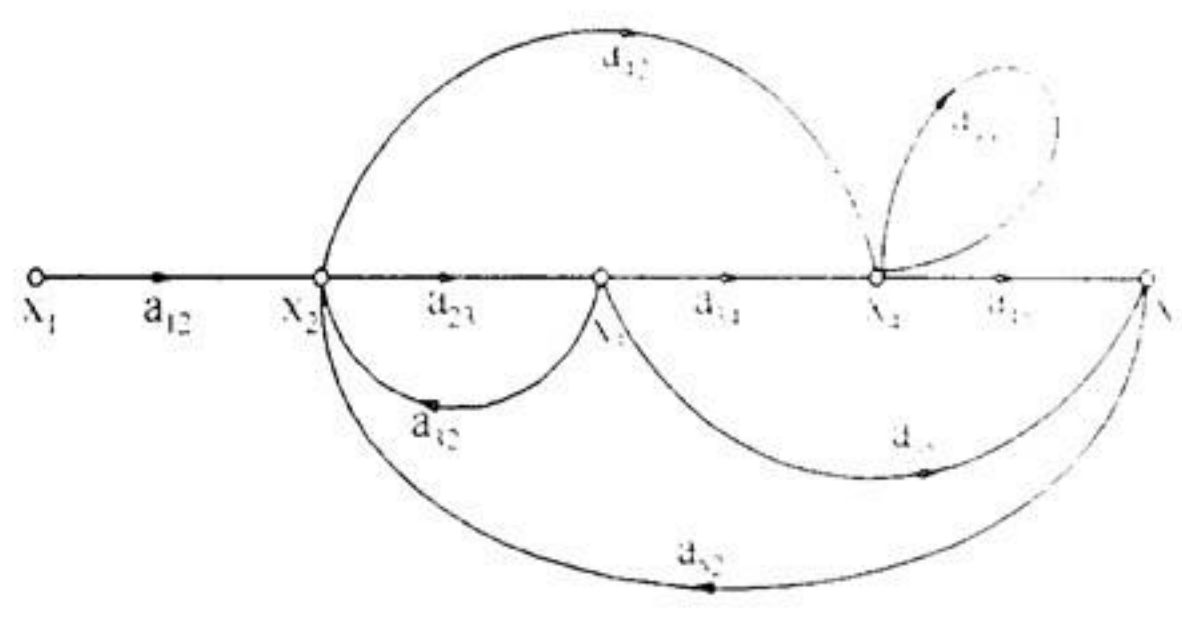
Attempt any five questions, selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

Unit-I

- Write rules of block diagram algebra for :
 - Combining blocks in cascade. [3]
 - Moving a summing point after a block. [3]
 - Moving a summing point ahead of a block. [3]
 - Moving a take off point after a block. [3]
 - Moving a take off point ahead of a block. [2]
 - Eliminating a feedback loop. [2]

OR

- Find the overall gain using mason's gain formula



[16]

Unit-II

- Define and derive the mathematical expressions for :
 - Rise time of second order system.
 - Peak time of second order system.
 - Peak overshoot.
 - Settling time. [4×4=16]

OR

- Derive the expressions for steady state error for various inputs (unit - step; unit ramp; unit parabolic) and system (Type - 0; Type - 1; Type - 2) [16]

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Unit-III

- A feedback control system has an open - loop transfer function

$$G(S)H(S) = \frac{K}{S(S+3)(S^2+2S+2)}$$

Find the root locus as K is varied from 0 to ∞. [16]

OR

- Consider a sixth order system with the characteristic equation

$$S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16S + 16 = 0$$

Find whether system under consideration is stable or not [16]

Unit-IV

- Draw the bode plot for the transfer function.

$$G(s) = \frac{64(S+2)}{S(S+0.5)(S^2+3.2S+64)}$$

[16]

OR

- Consider a feedback system whose open loop transfer function is

$$G(S)H(S) = \frac{K}{S(Ts+1)}$$

Determine whether the system is stable or not using Nyquist plot. [16]

Unit-V

- Differentiate between lead, lag and lead - lag networks. [8]
 - Write short note on proportional, derivative and integral controllers. [8]

OR

- Derive the transfer function of lag lead compensator in frequency domain. [8]
 - Derive expression for lead compensation in time domain. [8]