5E 5043

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B. Tech. V Semester (Main/Back) Examination, Dec., 2014

ELECTRICAL ENGINEERING # 5EE3A

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

1. Write rules of block diagram algebra for :

   (*a*) Combining blocks in cascade. [3]

   (*b*) Moving a summing point after a block. [3]

   (*c*) Moving a summing point ahead of a block. [3]

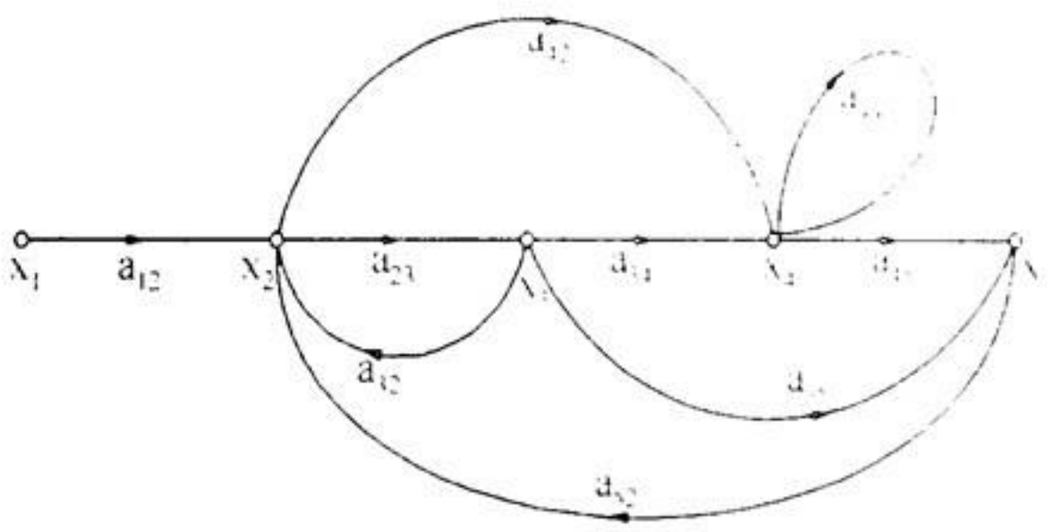
   (*d*) Moving a take off point after a block. [3]

   (*e*) Moving a take off point ahead of a block. [2]

   (*f*) Eliminating a feedback loop. [2]

OR

1. Find the overall gain using mason's gain formula



[16]

Unit–II

2. Define and derive the mathematical expressions for :

   (*a*) Rise time of second order system.

   (*b*) Peak time of second order system.

   (*c*) Peak overshoot.

   (*d*) Settling time. [4×4=16]

OR

2. 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]

Unit–III

3. 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

3. 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

4. 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

4. 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

5. (*a*) Differentiate between lead, lag and lead - lag networks. [8]

   (*b*) Write short note on proportional, derivative and integral controllers. [8]

OR

5. (*a*) Derive the transfer function of lag lead compensator in frequency domain. [8]

   (*b*) Derive expression for lead compensation in time domain. [8]