

5E5043

Roll No. _____

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5E5043

B. Tech. V Sem. (Main / Back) Exam., Dec. 2014

**Electrical Engineering
5EE3A Control Systems
Common with EE, EX**

Time: 3 Hours

Maximum Marks: 80

Min. Passing Marks: 24

Instructions 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.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205)

1. Semi – log paper

2. Graph paper; log tables

UNIT – I

Q. 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]

(c) Moving a take off point ahead of a block

[2]

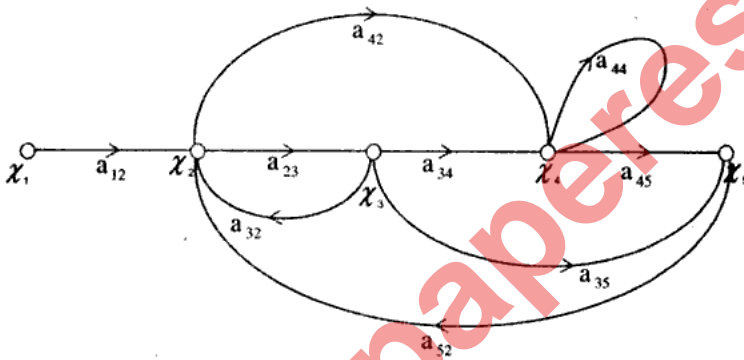
(f) Eliminating a feedback loop

[2]

OR

Find the overall gain using mason's gain formula.

[16]



UNIT - II

Q. 2 Define and derive the mathematical expressions for: - rtuonline.com

[4×4=16]

- (a) Rise time of second order system.
- (b) Peak time of second order system
- (c) Peak overshoot
- (d) Settling time

OR

Derive the expressions for steady state error for various inputs (unit – step; unit ramp; unit parabolic) and systems (Type – 0; Type – 1; Type – 2)

[16]

UNIT – III

- Q. 3 (a) A feedback control system has an open – loop transfer function [16]

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

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

OR

- (b) Consider a sixth order system with the characteristic equation [16]

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

Find whether system under consideration is stable or not.

UNIT – IV

- Q. 4 Draw the bode plot for the transfer function. [16]

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

OR

- Consider a feedback system whose open loop transfer function is [16]

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

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

UNIT – V

- Q. 5 (a) Differentiate between lead, lag and lead – lag networks. [8]
(b) Write short note on proportional, derivative and integral controllers. [8]

OR

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

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