

C 14713

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Name.....

Reg. No.....

**SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION
DECEMBER 2010**

EC 04 603—CONTROL SYSTEMS

(2004 admissions)

Time : Three Hours

Maximum : 100 Marks

Answer all questions.

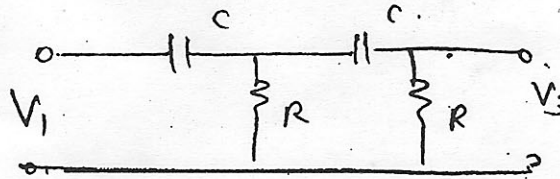
- I. (a) Explain the merits and demerits of open loop and closed loop systems.
(b) Explain the role of computers in automatic control.
(c) What are standard test signals ? Explain.
(d) Define and explain damping ratio and its significance.
(e) Explain the theory of Nyquist criterion.
(f) Differentiate discrete time system from continuous time systems.
(g) Define and explain multi-rate sampling.
(h) Explain the properties of state transition matrix.

(8 × 5 = 40 marks)

- II. (a) (i) Draw the general schematic diagram of a control system and explain it. (7 marks)
(ii) Differentiate open-loop system from closed loop system. (8 marks)

Or

- (b) Draw the signal flow graph for the network shown below and hence find V_3/V_1 .



- III. (a) Derive the step response of a second order system. Explain the steps.

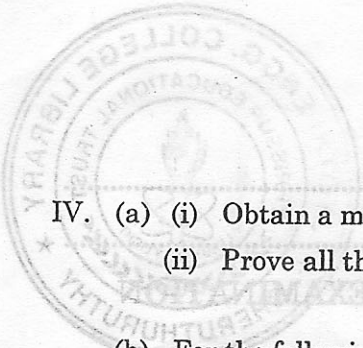
Or

- (b) Apply Routh's criterion to test the stability of the system described by

$$s^5 - 2s^4 + 2s^3 + 4s^2 - 11s - 10 = 0.$$

Explain the procedure.

Turn over



- IV. (a) (i) Obtain a mathematical equation for sampling. (7 marks)
- (ii) Prove all the properties of Z transform. (8 marks)

Or

- (b) For the following forward path transfer function of an unity feedback control system draw the Nyquist plot and hence test the stability of the system

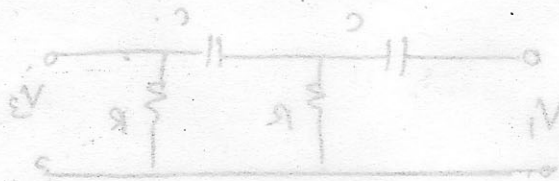
$$G(s) = \frac{1}{(s+1)(s-1)}$$

- V. (a) (i) Explain Diagonalization in detail. (7 marks)
- (ii) Explain the state space models for continuous and discrete cases. (8 marks)

Or

- (b) (i) Derive the properties of state transition matrix. (7 marks)
- (ii) Derive the solution of homogenous state equations. (8 marks)

[4 × 15 = 60 marks]



III. (a) Derive the step response of a second order system. Explain the steps.

Or

(b) Apply Routh's criterion to test the stability of the system described by

$$s^6 - 2s^4 + 2s^3 + 4s^2 - 1s - 10 = 0$$

Explain the procedure.