

Seat No.	
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SF - 522

Total No. of Pages : 3

T.E. (ETC) (Part - III) (Semester - V) (Revised) Examination,

November - 2017

CONTROL SYSTEMS

Sub. Code : 66315

Day and Date : Saturday, 11 - 11 - 2017

Total Marks : 100

Time : 10.00 a.m. to 01.00 p.m.

Instruction : All questions are compulsory.

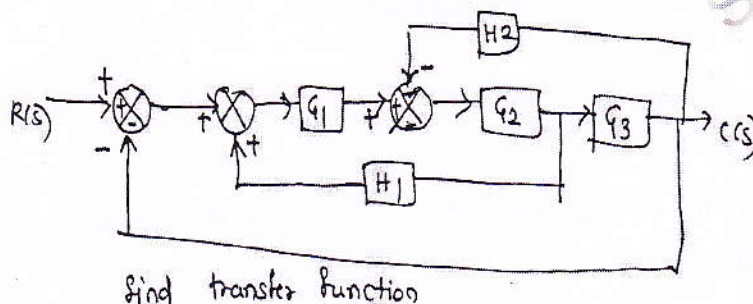
SECTION - I

Q1) Solve any two

[2 × 9 = 18]

- Define masson's gain formula and various signal flow graph terms
- Explain block diagram reduction rules.

c)



Q2) Solve any two

[2 × 8 = 16]

- Derive relation for impulse response of unit step and ramp for first order system
- Derive expression for $t_r, t_p, t_d, \text{max. peak overshoot}$

P.T.O.

c) For the system $\frac{C(s)}{R(s)} = \frac{16}{s^2 + 1 - 6s + 16}$

- Find
- i) Rise time
 - ii) Peak time
 - iii) Settling time
 - iv) Peak overshoot (Mp)%

Q3) Solve any two

[2 × 8 = 16]

- a) State and explain Hurwitz and Routh criteria

b) $\frac{C(s)}{R(s)} = \frac{K}{s^4 + 6s^3 + 30s^2 + 60s + K}$ Find 'K' for stable system.

- c) Find stability :

i) $s^4 + 2s^3 + 8s^2 + 4s + 3 = 0$

ii) $3s^4 + 10s^3 + 5s^2 + 5s + 2 = 0$

SECTION - II

Q4) Solve any two

[2 × 9 = 18]

- a) Explain the procedure for constructing the bode plot from system function.
- b) Sketch bode plot and determine gain crossover and phase crossover frequencies.

$$G(s) = \frac{10(s^2 + 21s + 20)}{(s + 2)(s + 10)(s + 1)^2}$$

- c) Draw Nyquist plot and comment on stability of unity feedback system

$$G(s) = \frac{(s+2)}{(s-1)(s+1)}$$

Q5) Solve any two

[2 × 8 = 16]

- Derive state model for general transfer function of system using canonical variables.
- Obtain the state model of system in controllable canonical form having transfer function.

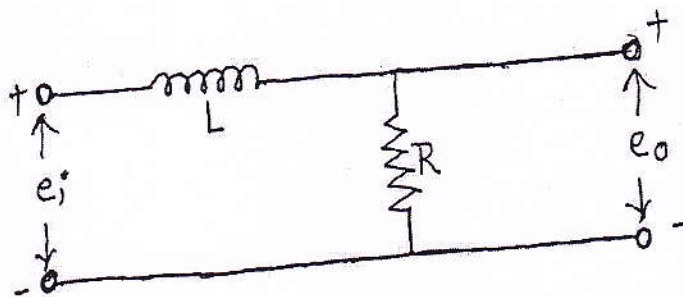
$$\frac{Y(s)}{U(s)} = \frac{s^3 + 5s^2 + 16s + 12}{s^3 + 11s^2 + 22s + 6}$$

- Explain state of the system and state space equation in canonical form.

Q6) Solve any two

[2 × 8 = 16]

- Explain the need of compensation and explain lag compensation.
- Write note on PID controllers.
- Define polar plot and sketch polar plot for circuit.



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