

TE SEM-V - 04 - EXTC
PCS

18/12/18

QP Code : 1809

(Old Course)

(3 Hours)

[Total Marks : 100

- N.B. : (1) Question No. 1 is compulsory.
(2) In total solve five questions.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if necessary.

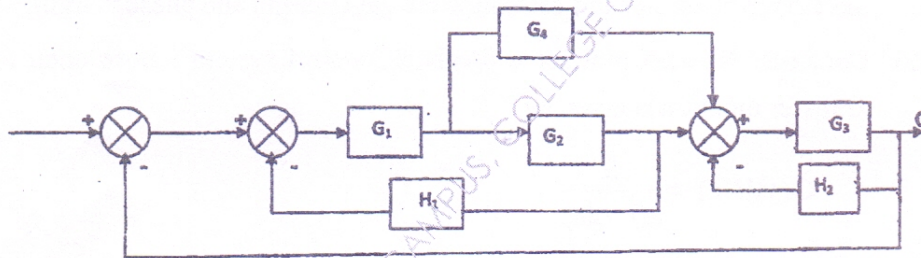
1. Attempt any Four questions.

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- (1) Define the Transfer function.
- (2) Define type and order of a system,
- (3) Find the step response of a system if its impulse response in $5e^{-10t}$
- (4) State the Nyquist stability criterion.
- (5) What is the need for a compensator.
- (6) Comment on relative stability.
- (7) Define state model.

2. (a) Find the transfer function of the system given below by block diagram reduction method and verify it by signal flow graph.

10



(b) The overall transfer function of a unity feed back system is given by

10

$$\frac{C(S)}{R(S)} = \frac{10}{s^2 + 6s + 10}$$

Find i) The position, velocity and acceleration error constants.

3. (a) For a unity feed back system back $G_s = \frac{36}{s(s+0.72)}$ Determine the

10

characteristics equation and hence calculate

- i) Natural Frequency
- ii) Damping ratio
- iii) Peak time
- iv) Setting time (2%)
- v) Peak over shoot

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- (b) Sketch bode plot for the given transfer function and determine the phase margin and gain margin. 10

$$G_s = \frac{75(1+0.2s)}{s(s^2 + 16s + 100)}$$

4. (a) Use Routh-Hurwitz criterion and comment on the stability of the system of characteristics equation $s^5 + 4s^4 + 8s^3 + 8s^2 + 7s + 4 = 0$ 10
 (b) Obtain the Root Locus diagram for a Unity feed back system with the open loop transfer function. 10

$$G(s) = \frac{K}{s(s^2 + 6s + 10)}$$

5. (a) The open loop transfer function of a unity feedback system is given by 10

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

Sketch the polar plot and determine the gain margin and phase margin.

- (b) Construct Nyquist plot for a feedback control system whose open loop transfer function is given by 10

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

6. (a) Define the following term related to 2nd order system subjected to unit step J/P 10
 a) Rise Time b) Peak Time c) Peak overshoot
 (b) Define gain and phase margin of the system. Comment on the stability of the system based on gain and phase margin. 10

7. Write short notes on any Two 20
 a) Stepper Motor
 b) Synchros
 c) Mason's Gain Formula