TE -sem-V - EXTC

PCS

(old)

4/6/15

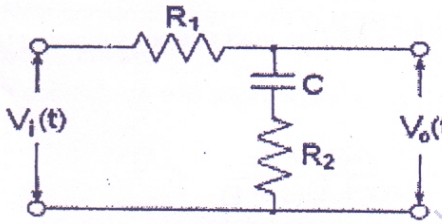
QP Code : 3885

(OLD COURSE)

(3 Hours) **[Total Marks : 100**

N.B. (1) Question No.1 is **compulsory** .
(2) Solve any **four** questions out of the **remaining** questions.
(3) Assume **suitable** data wherever **necessary**.
(4) Draw **neat** labeled **diagram**.
(5) **Figures** to the the **right** indicate **full** marks.

Q. (1) (a) Find the transfer function of the given network. (5)



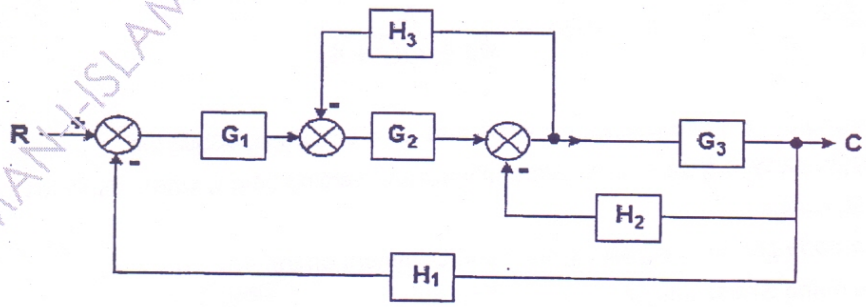
(b) Compare between open loop and close loop system. (5)

(c) Define gain and phase margin of the system .Comment on the stability of the system based on gain and phase margin. (5)

(d) Define the following terms related to second order system subjected to unit step input. (5)

i. Rise time
ii. Peak time
iii. Peak overshoot
iv. Delay time
v. Settling time

Q. (2) (a) Find the transfer function from the block diagram using block diagram reduction rules. (10)



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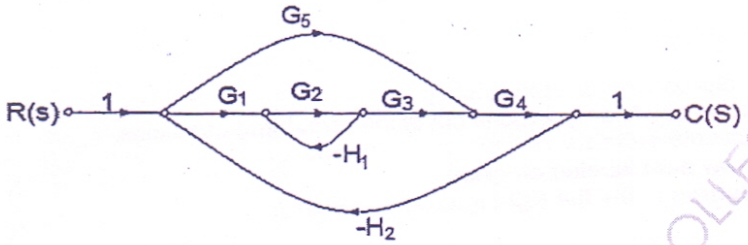
(b) For the signal flow graph ,find the transfer function using Mason's gain formula. (10)



Q.(3) (a) Derive the time response expression for a second order system subjected to unit step input. (10)

(b) A unity feedback system has – (10)

$$G(s) = \frac{40(s+2)}{s(s+1)(s+4)}$$

Determine : (i) Type of the system
(ii) All error coefficients
(iii) Error for ramp input with magnitude 4.

Q. (4) (a) Discuss the stability for the following systems for given characteristic equations using Routh-Hurwitz criterion. (10)

i. $s^4 + 8s^3 + 24s^2 + 32s + 16 = 0$

ii. $s^6 + 3s^5 + 5s^4 + 9s^3 + 8s^2 + 6s + 4 = 0$

(b) Sketch the root locus for the given system and comment on the stability. (10)

$$G(s)H(s) = \frac{K}{s(s+2)(s+4)}$$

Q. (5) (a) For the second order system having $\xi = 0.6$ and $\omega_n = 5$ rad/sec, obtain the rise time t_r, peak time t_p ,maximum overshoot Mp and settling time t_s when subjected to a unit step input. (10)

(b) Construct a bode plot for the given system and Comment on the system stability. Indicate Gain and Phase margin. (10)

$$G(S)H(S) = \frac{80}{S(S+2)(S+20)}$$

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Q.(6) (a) For unity feedback system, system is marginally stable and oscillates with frequency 4 rad/sec. Find K_{mar} and 'q'. (10)

$$G(S) = \frac{4}{(s^2 + qs + 2k)s}$$

(b) Derive the transfer function of field controlled DC servomotor. (10)

Q.(7) Write short note on any **two** of the followings. (20)

a) Stepper motor construction and use of stepper motor in control systems.

b) Nyquist stability criteria.

c) Static error coefficients and steady state errors.
