T.E - SEM-VI - OLD - ELECTRICAL ENGG. - C.S-I

04

12/05/2015

Pg - 1/3

Q.P. Code : **4257**

(OLD COURSE)

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining.
(3) Use graph paper and semi log paper where necessary.
(3) **Assume** suitable **data** if **necessary**.

1. Solve any **four** of following
   (a) Functionally, how do closed-loop systems differ from open-loop systems? **5**
   (b) Explain meaning of proportional, derivative and integral controller. **5**
   (c) Explain conversion of a system represented in state-space into a transfer function. **5**
   (d) Find the transfer function relating the capacitor voltage, Vc(s), to the input voltage, V(s). **5**

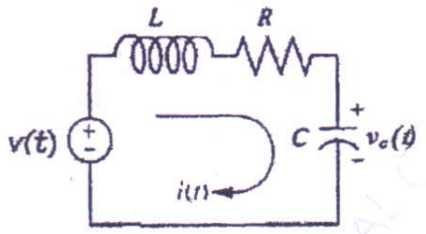

Figure 1 (Q.1 d)

   (e) What is effect of addition of zero to the system transfer function? **5**

2. (a) Find the transfer function, $G(s)=V_L(s)/V(s)$, for the circuit given in Figure 2 (Q.2 a). **10**

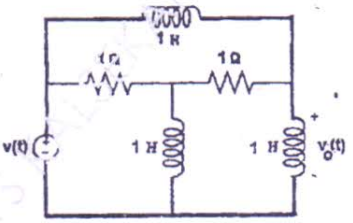

Figure 2 (Q.2 a)

   (b) Derive the transfer function of armature controlled DC motor. **10**

3. (a) Find the equivalent transfer function, $T(s)= C(s)/R(s)$, for the system shown in Figure 3 (Q.3 a). **10**

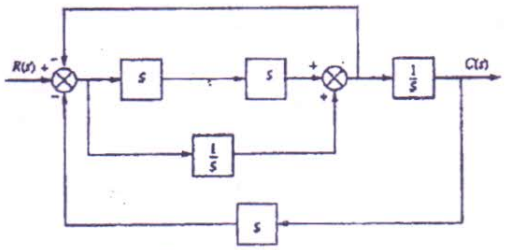

Figure 3 (Q.3 a)

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(b) Use Mason's rule to find the transfer function of the signal-flow diagram shown in Figure 3 (Q.3 b). 10

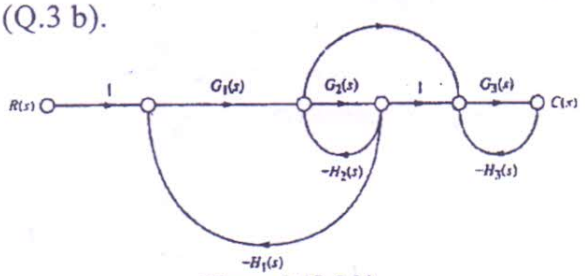

Figure 3 (Q.3 b)

4. (a) A unity feedback system is characterized by an open loop. 10

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

Determine the gain K, so that the system will have a damping ratio of 0.5. For this value of K determine setting time, % OS and peak time.

(b) Find the state-space representation of the transfer function shown in Figure 4 (Q.4 b). 10

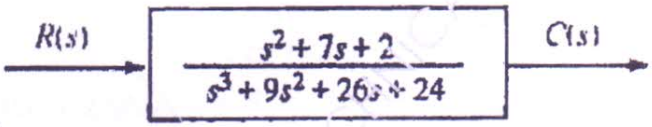

Figure 4 (Q.4 b)

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5. (a) Construct the root locus for a unity feedback system for $0 \le K \le \infty$ given by

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

Find value of gain K at $\xi = 0.5$

10

(b) A unity feedback system has the following forward transfer function :

$$G(s)=\frac{1000(s+8)}{(s+7)(s+9)}$$

(i) Evaluate system type, *Kp, Kv,* and *Ka.*

(ii) Use your answers of (i) to find the steady-state errors for the standard step, ramp, and parabolic inputs.

6. (a) Determine the range in which K must lie for the system to be stable for the system whose closed loop transfer function is given by **10**

$$T(s)=\frac{K}{S^4+6s^3+30s^2+60s+25}$$

(b) Draw Bode Plot for the system having **10**

$$G(s)=\frac{10}{s(1+0.01s)(1+0.1s)}, \qquad H(s)=1$$

Find GM, PM, gain and phase crossover frequency.

7. Write short note on any **THREE**. **20**
   (a) Routh's stability criterion
   (b) Bode plot and steady state error constants
   (c) Second order time response specifications
   (d) Correlation between time response and frequency response.
