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Question Paper Code : 30137

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Third Semester

Electronics and Communication Engineering

EC 3351 – CONTROL SYSTEMS

(Common to : Electronics and Telecommunication Engineering)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

- Find the transfer function of the network as shown in Fig. 1.

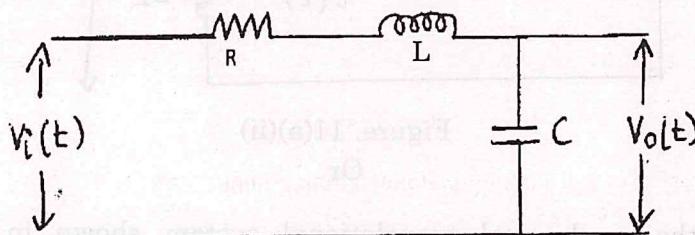


Fig. 1

- List the components of feedback control system.
- Recall the importance of PD control? State the effect of a PD controller on the system performance.
- Find the order of the closed-loop transfer functions for the systems given by
 - $C(s)/R(s) = 10[1 + 2s + s^2]/[1 + 3s + s^2 + s^3]$.
 - $C(s)/R(s) = 6[1 + 2s]/[1 + 4s]$.
- List the disadvantages of frequency response analysis.
- List the effects of dominant poles.
- State the angle and magnitude criterion for root locus.
- Define Gain margin.
- Mention the different canonical forms.
- List the advantages of state-variable analysis.

12. (a) (i) The unity feedback system is characterized by an open loop transfer function, $G(s) = \frac{K}{s(s+10)}$. Determine gain K , so that the system will

have a damping ratio of 0.5 for this value of K . Determine settling time, peak over shoot and time to peak overshoot for a unit step input. (6)

- (ii) When a unit-step signal is applied, the time response of the second order system is $c(t) = 1 + 0.2e^{-60t} - 1.2e^{-10t}$. Determine

- (1) the closed loop transfer function of the system
- (2) undamped natural frequency. ω_n and
- (3) damping ratio of the system. (7)

Or

- (b) A unity feedback control system has an open loop transfer function $G(s) = 10/(s(s+2))$. Find the rise time percentage overshoot, peak time and settling time for a step input of 12 units.

13. (a) The loop transfer function of a system is given by $G(s)H(s) = (Ks^2)/(1+0.2s)(1+0.02s)$. Sketch the bode plot for the given system.

Or

- (b) Sketch the polar plot of the function: $G(s)H(s) = (s+2)/[s^2(s+2)(2s+1)]$.

14. (a) The unity feedback control system has an open loop transfer function : $G(s)H(s) = K/[s(s+4)(s^2+4s+20)]$. Sketch the root locus.

Or

- (b) (i) Examine the stability of the system using Routh's criterion for the characteristic equation of a system given by $s^5 + 2s^4 + 3s^3 + 6s^2 + 10s + 15 = 0$. (6)

- (ii) Determine the stability of the following system using Routh's criterion: $G(s)H(s) = 1/(s+2)(s+4)$. (7)