

1128
B.E. (Electronics and Communication Engineering)
Fifth Semester
EC-513: Control System

Time allowed: 3 Hours

Max. Marks: 50

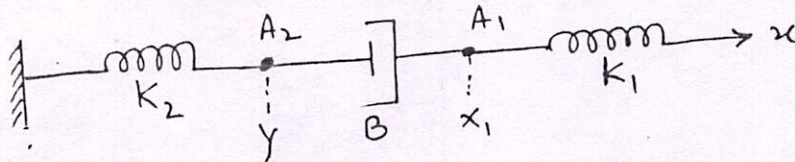
NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.

x-x-x

- Q.1. i) Give two examples of linear and no-linear control system each. (5*2=)
- ii) What is an improper transfer function?
- iii) What is a characteristic equation? Why is it called so?
- iv) What is break frequency in Bode Plot?
- v) What are the performance criteria specified for compensators?

PART-A

- Q.2 i) What is a signal flow graph and explain how is it used to find the transfer function of a system. (5)
- ii) Consider the mechanical system shown in Fig. below. Find the transfer function $\frac{Y}{X}(s)$ for it.



- Q.3 i) Use Routh's Hurwitz criteria to find the stability of the system whose characteristics equation is given as (5)
- $$s^5 + s^4 + 2s^3 + 2s^2 + 3s + 5 = 0$$
- ii) Consider a unity negative feedback system with the following open loop T.F. $G(s) = \frac{K}{s(s+1)(s+2)}$. The steady state error $e_{ss} \leq 2$ rad for a velocity input of 2 rad/sec. Find K_v and hence K. (5)

- Q.4 The open loop transfer function of a unity feedback control system is given by $G(s) = \frac{K}{s(s+3)^2}$. (10)
- Sketch the root locus plot of the closed loop system for positive values of K and there from determine the values of K that would make the system stable.

PART-B

- Q.5 Draw the Bode Plot for the transfer function given below and comment upon the stability of the system. (11)

$$G(s) = \frac{100(s+2)}{s(s+5)(s+10)}$$

- Q.6 i) Explain the concept of controllability and observability of the system. Why are they important? (5)
- ii) Explain the design steps of a PID controller. Hence explain the significance of P,PI and PID controllers in system performance. (5)
- Q.7 i) Describe the different types of lead compensators? Derive its transfer function and draw the bode plot. (5)
- ii) How does pole placement affect the performance of the system? Explain (5)

x-x-x