

1108  
B.E., (Electrical and Electronics Engineering)  
Fourth Semester  
EE-402: Control Engineering  
(May - 2017)

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I (Part-A) which is compulsory and selecting two questions each from Part B-C. Assume and specify any missing data. Graph paper and semilog graph paper shall be provided.

x-x-x

Part- A

- I
- Give basic equations and analogy of electrical and mechanical systems. 5x2
  - Define steady state error. Derive an expression for velocity and acceleration error constants.
  - How is a servo motor different from a DC motor?
  - Define: Phase margin and gain margin. What are the implication of negative and positive Gain Margin?
  - What is electrical zero position of control transformer of synchros? Illustrate with diagram.

Part- B

- II (a) Obtain the output of the system in Fig. 1 using block reduction technique. (5)

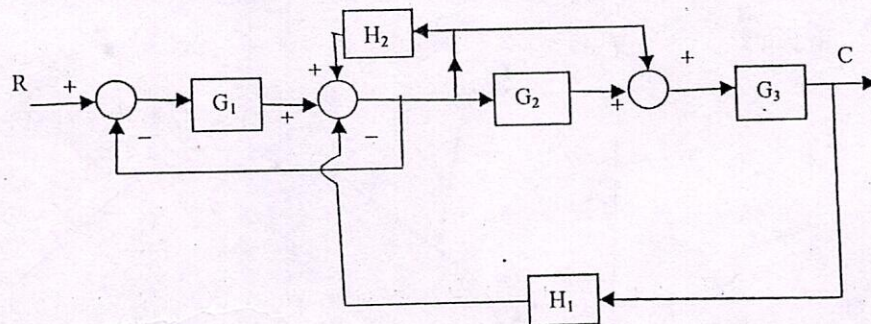


Fig.1

- (b) Obtain differential equations for the system shown in Fig 2 and draw the analogous electrical circuit. (5)

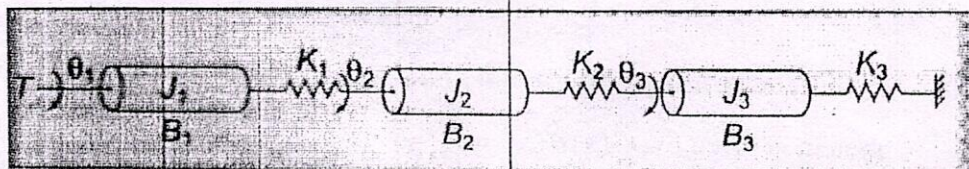


Fig 2

- III (a) Discuss the effect of feedback in a control system on Control of effect of disturbance signals. (5)
- (b) Explain how a pneumatic system works. Give advantages and disadvantages of pneumatic systems. (5)

- IV (a) Determine the time response specifications for output for unit step input (y-output, x-input) to a system having system equation as follows: (5)

$$\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 16y = 9x$$

- (b) A feedback control system has an open loop transfer function (5)

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

- (i) Find limiting value of K for maintaining stability.  
 (ii) If a zero at  $s=-4$  is added to the forward transfer function, how is the stability affected?

Part-C

- V (a) Explain the correlation between time and frequency domain specifications for second order system. (5)

- (b) Sketch the root locus of a system represented by the transfer function (5)

$$G(s) = \frac{K}{s(s+1)} \text{ with unit feedback.}$$

- VI (a) Determine the open loop transfer function of the system whose plot is shown in Fig 13: (5)

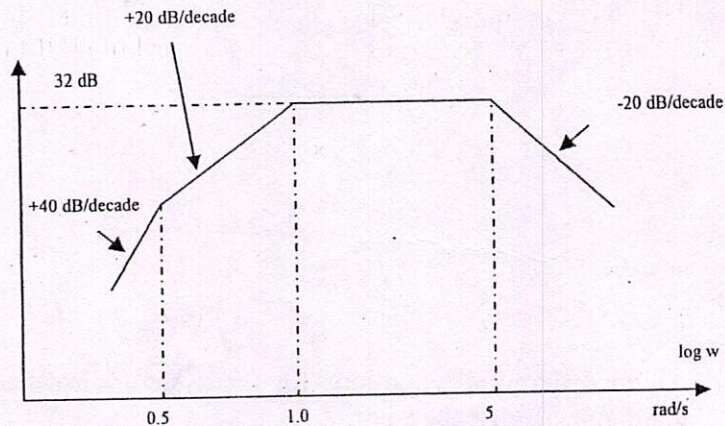


Fig 13

- (b) Find stability using Nyquist plot of the closed loop system whose open loop system is given by:  $G(s)H(s) = \frac{K(s-2)}{(s+1)^2}$  (5)

- VII (a) Explain the principle, working and construction of d.c. tachogenerator. (5)

- (b) Write a note on M-N circles. (5)