



P.E.S. College of Engineering, Mandya - 571 401
 (An Autonomous Institution affiliated to VTU, Belgaum)
Seventh Semester, B.E. - Mechanical Engineering
Semester End Examination – Dec - 2014
Automatic Control Engineering

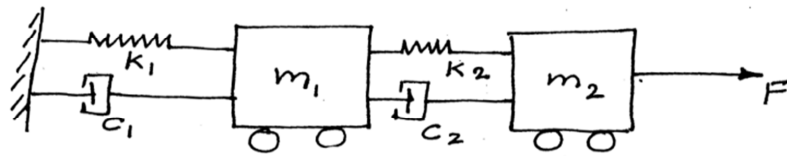
Time: 3 hrs

Max. Marks: 100

Note : Answer any **FIVE** full questions selecting at least **TWO** full questions from each part.

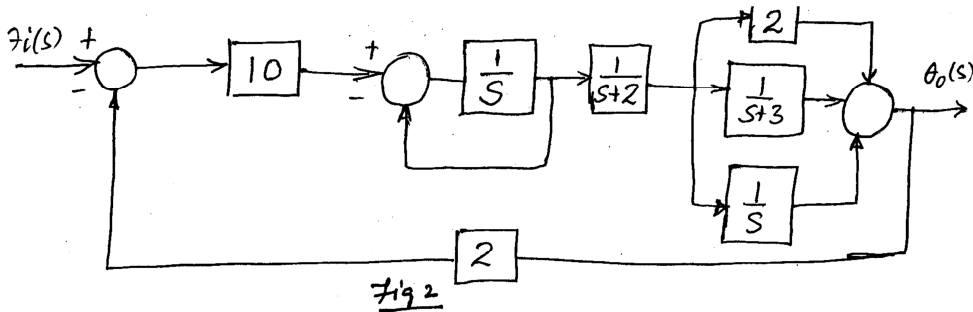
PART - A

- 1. a. Classify the control system? 6
- b. With neat block diagram enumerate the difference between open loop control system and closed loop control system. 6
- c. What are the basic ingredients of control system? 3
- d. What are the requirements for a control system? 5
- 2. a. Obtain the differential equations for the system shown in Q. Fig 2(a) 8



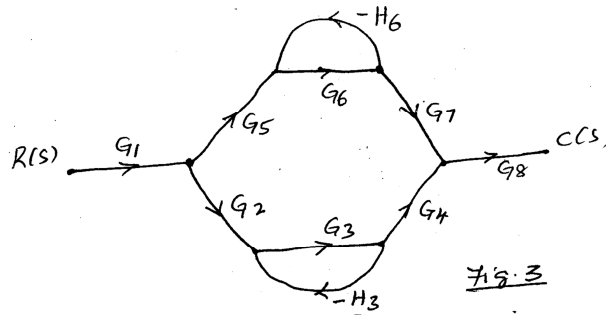
Q. Fig 2(a)

- b. Write an equation on armature controlled D.C. motor on load. 12
- 3. a. Reduce given block diagram into canonical form and determine closed loop transfer function. Also represent in open loop form for Q. Fig 3(a)



Q. Fig 3(a)

- b. Obtain the overall transfer function $\frac{C(s)}{R(s)}$ the signal flow graph shown in Q. Fig 3(b) 10



Q. Fig 3(b)

- 4 a. Derive the complete response for II order mechanical system for under damping case. Also draw the response curve. 12
- b. A system has a following characteristic equation. Determine value of K, so that system is stable by R-H criterion. $2S^4 + 3S^3 + 4S^2 + S + K = 0$ 8

PART – B

- 5 a. Write a note on: (i) Phase Margin (ii) Gain Margin 6
- b. Plot the polar plot to obtain loop transfer function for a system 6

$$G(S)H(S) = \frac{10}{(S+2)(S+4)(S+6)}$$

- c. Sketch the Nyquist plot for a system whose closed loop transfer function is 8

$$G(S)H(S) = \frac{120}{(S+3)(S+4)}$$

- 6 Sketch the Bode plot for the system having $G(S)H(S) = \frac{20}{S(1+0.1S)}$ 20

- 7 A unity feed back system has closed loop transfer function is given by $\frac{C(S)}{R(S)} = \frac{K}{S^3 + 2S^2 + 2S + K}$. Draw root locus plot & determine the value of K for which system will be stable. 20

8. a. Write a note on with block diagram.
- (i) proportional plus Integral control action 10
- (ii) Proportional plus derivative control action.
- b. With sketch write a note on: 10
- (i) Lag compensator
- (ii) Lead Compensator.