Exam.Code:0934
Sub. Code: 6978

1058

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 which is compulsory and selecting two questions from each Section.

x-x-x

1. Attempt all the following questions.
   a. Elucidate feedback system and its effects?
   b. Explain the advantages and disadvantages of block diagram representation.
   c. How damping ratio affects the time response of a second order system?
   d. Define (i) bandwidth and (ii) resonant peak.
   e. Explain (i) gain margin and (ii) phase margin. [5x2=10]

Section I

2. Draw the signal flow graph and obtain transfer function for a system which is described by the set of following algebraic equations [10]

$$y_2 = a_{12} y_1 + a_{32} y_3$$
$$y_3 = a_{23} y_2 + a_{43} y_4$$
$$y_4 = a_{24} y_2 + a_{34} y_3 + a_{44} y_4$$
$$y_5 = a_{25} y_2 + a_{45} y_4$$

3. Determine the value of K and a, so that the system shown in Figure 1 oscillates at frequency of 2 rad/s and has no poles in the right half of s plane. [10]

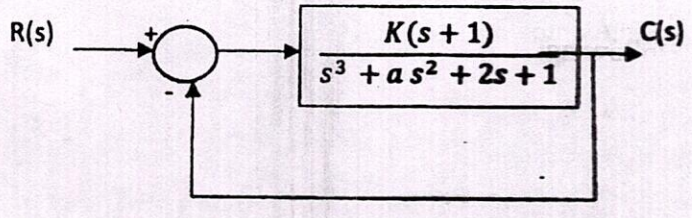

Figure 1.

P.T.O.

4. Figure 2 shows the block diagram of servo mechanism using velocity feedback

   a. Determine the forward path gain K which is required to produce oscillatory step response with an overshoot of 50%. Assume K_v=0.

   b. Calculate frequency of damped oscillation [10]

   c. Determine the value of K_v which will reduce the overshoot from 50% to 10%.

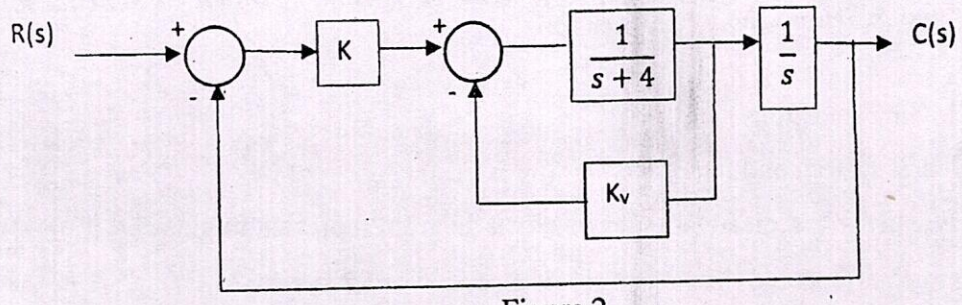

Figure 2.

Section II

5. Sketch the Nyquist plot and examine the closed loop stability of a control system having open loop transfer function given below: [10]

$$G(s)H(s) = \frac{Ks(1+2s)}{s^3+4s+8}$$

6. Sketch the root locus diagram of the control system having the transfer function: [10]

$$G(s)H(s) = \frac{K(1+s)}{s(s-1)(s^2+4s+16)}$$

7. Write short notes on the following: [10]

   a. Stepper motors

   b. Tacho-generators

X-X-X