Code No: RT31043 **R13** SET - 1

III B. Tech I Semester Supplementary Examinations, May - 2016
CONTROL SYSTEMS
(Common to ECE and EIE)

Time: 3 hours Maximum. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**
(Normal and semi & polar graph sheet are the supplied)

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PART –A

1 a) What are the characteristics of negative feedback? [3M]

b) Compare the AC and DC servomotor. [4M]

c) What is the effect on system performance when a proportional controller is introduced in a system? [4M]

d) What are asymptotes? How will you find the angle of asymptotes? [4M]

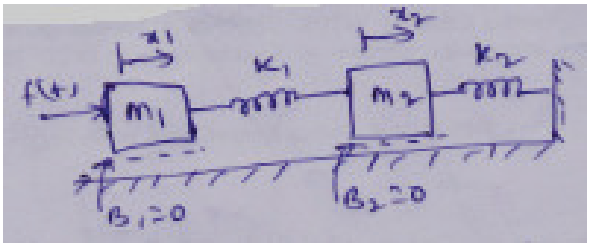
e) What is phase and gain crossover frequency? [3M]

f) Why compensation is necessary in feedback control system. [4M]

PART -B

2 a) Define open loop and closed loop systems. Mention their merits and demerits. [8M]

b) Draw the free body diagram and write the differential equations describing the dynamics of the system shown in below figure and obtain the transfer function $\frac{X_2(s)}{F(s)}$ [8M]



3 a) For the system represented by the given equations find the transfer function x_5/x_1 by the help of signal flow graph technique. [8M]

$x_2 = a_{12}x_1 + a_3 x_3 + a_{42} x_4 + a_{52} x_5$

$x_3 = a_{23} x_2$

$x_4 = a_{34} x_3 + a_{44} x_4$

$x_5 = a_{35} x_3 + a_{45} x_4$

Where x_1 is input variable and x_5 is output variable.

b) Derive the transfer function of field controlled AC Servo motor. [8M]

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4 a) What is meant by step input, ramp input and impulse input? How do you represent them graphically? [6M]

b) The open loop transfer function of a unity feedback system is given by [12M]

$G(s)\frac{K}{s(1+Ts)}$ Where K and T are positive constant. By what factor should the amplifier gain K be reduced so that the peak overshoot of unit step input of the system is reduced from 75% to 25%.

5 a) Draw the root lows plot for a system having open loop transfer functions is [8M]

$G(s) = \frac{K}{S(S+1)(s+5)}$.

b) Using Routh criterion investigate the stability of a unity feedback control system whose open loop transfer function is given by. [8M]

$$G(S) = \frac{e^{-sT}}{S(S+2)}$$

6 a) Construct Bode plot for the system whose open loop transfer function is given below and determine (i) the gain margin (ii) the phase margin and (iii) the closed loop stability $G(S)H(S) = \frac{4}{S(1+0.5S)(1+0.08S)}$. [8M]

b) Sketch Nyquist plot whose open loop transfer function is given by [8M]

$G(S)H(S) = \frac{KS^2}{S^3+4S+4}$ and examine closed loop stability in terms of parameter K.

7 a) The open loop transfer function of a unity feedback control system is given by [8M]

$G(S) = \frac{K}{S(1+0.2S)}$ design a suitable compensator such that the system will have K_v=10 and P.M = 50^0.

b) The transfer function of a control system is given by [8M]

$\frac{Y(S)}{U(S)} = \frac{S+2}{S^3+9S^2+26S+24}$ check for controllability and observability.

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