ONE TIME EXIT SCHEME

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10AE71

Seventh Semester B.E. Degree Examination, April 2018
Control Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.

PART – A

1 a. Write notes on open loop system and closed loop system and also list out the merits and demerits of open loop and closed loop systems. **(08 Marks)**

b. Describe about the PI, PD and PID controllers with suitable diagrams. **(12 Marks)**

2 a. Derive the F-V and F-I analogies. **(10 Marks)**

b. A dynamic vibration absorber is shown in Fig.Q2(b). Obtain the differential equations and also draw the analogous electrical circuit based on F-V analogy.

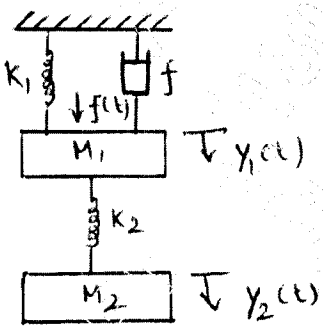

Fig.Q2(b) **(10 Marks)**

3 a. Determine the overall transfer function $\frac{C(S)}{R(S)}$ for the following system.

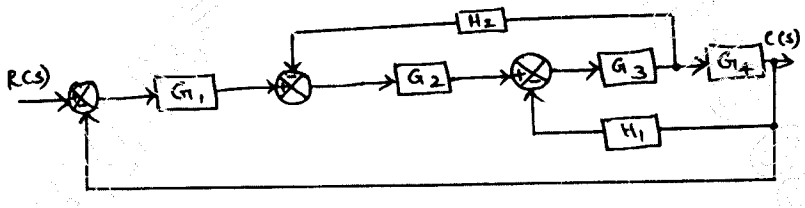

Fig.Q3(a) **(10 Marks)**

b. By using Mason's gain formula, find the overall gain $\frac{C(S)}{R(S)}$ for the signal flow graph.

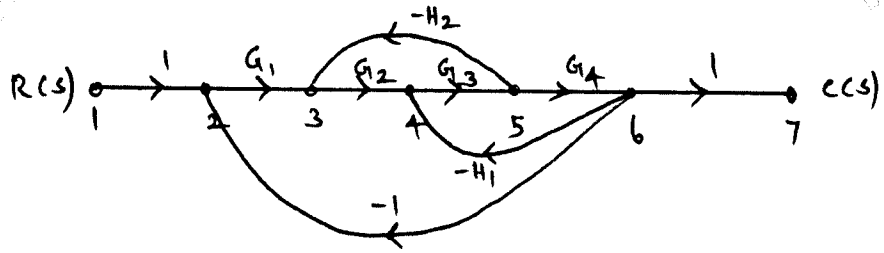

Fig.Q3(b) **(10 Marks)**

4 a. Explain about the special cases of Routh's criterion with suitable examples. (05 Marks)

b. Examine the stability of the system having characteristic equation by using RH metho $F(s) = s^6 + 3s^5 + 4s^4 + 6s^3 + 5s^2 + 3s + 2 = 0$. (10 Marks)

c. Derive the expression for peak time for an under damped second order system. (05 Marks)

PART – B

5 a. The open loop transfer function of a unity feedback system is given by

$$G(s) = \frac{1}{s(s+1)(1+2s)}.$$

Sketch the polar plot and determine the gain margin and phase margin. (12 Marks)

b. Write down the steps to solve the problems by using Nyquist criterion. (04 Marks)

c. Write short notes on M and N circles. (04 Marks)

6 a. Sketch the Bode plot for following transfer function:

$$G(s) = \frac{10}{s(1+0.4s)(1+0.1s)}$$ (16 Marks)

b. Define gain margin and phase margin. (04 Marks)

7 a. Sketch the root locus for the system, whose open loop transfer function is given by

$$G(s)H(s) = \frac{K}{s(s+3)(s+5)}$$ (15 Marks)

b. Describe the general rules for the construction of root locus. (05 Marks)

8 a. Explain the need for compensation and also describe about the lag-lead compensator wit suitable diagrams. (12 Marks)

b. Consider the system with state equation. Estimate the state controllability by Kalman's te and Gilbert's test.

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$$ (08 Marks)

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