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08IAR/MAR22

Second Semester M.Tech. Degree Examination, June-July 2009
Modern Control Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Derive the equation of motion of a simple Spring – Mass and damper system and devote the characteristic equation. **(10 Marks)**

b. Using the Hurwiz Criterion comment on the stability of the system.
$S^4 + 2s^3 + 8s^2 + 4s + 03 = \text{Zero}$. **(10 Marks)**

2 Sketch the Root locus for $o < k < \infty$, for the system with open loop transfer function and comment on stability. $G(s)H(s) = \dfrac{K}{s(s+2)(s^2+2s+2)}$ **(20 Marks)**

3 Construct the asymptotic "Bode plots" for the frequency response function $GH(JW) = \dfrac{1+s/2-(s/2)^2}{s(1+s/0.5)(1+s/4).}$ **(20 Marks)**

4 a. Write a note on M and N circles. **(08 Marks)**

b. Draw the polar plot of $\dfrac{K(1+s)}{s(1+0.1s)(1+0.4s)}$. **(12 Marks)**

5 Draw the Nyquist pot and examine the stability of the closed loop system whose OLTF is $G(s)H(s) = \dfrac{(6s+1)}{s^2(s+1)(3s+1)}$. **(20 Marks)**

6 a. Define three basic types of system compensators and the criterion for selection of the same. **(08 Marks)**

b. Discuss the general form of a lag-lead compensator using electrical network, Also furnish the sinusoidal transfer function for the same and explain the same using the Bode plot. **(12 Marks)**

7 a. Obtain a state model for the mechanical system shown in Fig.7(a) **(10 Marks)**

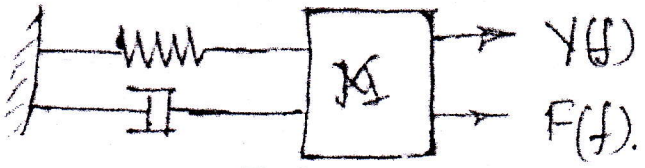

Fig.Q.7(a).

b. Explain direct digital control with a typical example. **(10 Marks)**

8 Write short notes on

a. Define node and Branch as applied to signal flow.graphs
b. Time Constant
c. Z and Inverse Z transforms
d. State variable concept. **(20 Marks)**

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