Total No. of Questions :8]   [Total No. of Printed Pages :2

Roll No ....

MEPE-103

M.E./M.Tech., I Semester

Examination, June 2016

Advanced Control System

Time : Three Hours

Maximum Marks : 70

Note : i)   Attempt any five questions.
ii) All questions carry equal marks.
iii) Assume suitable data if not given.

1. a) Explain the discretization of a continuous time state space model.   7
   b) Sketch the root loci for the system shown in figure below (The gain (K) is assumed to be positive). Observe that for small or large values of (K) the system is overdamped and for medium values of (K) it is underdamped.   7
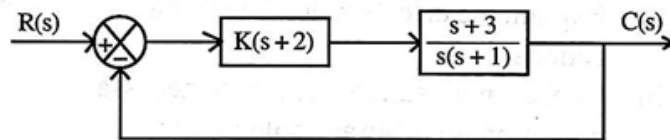

Figure : Control System

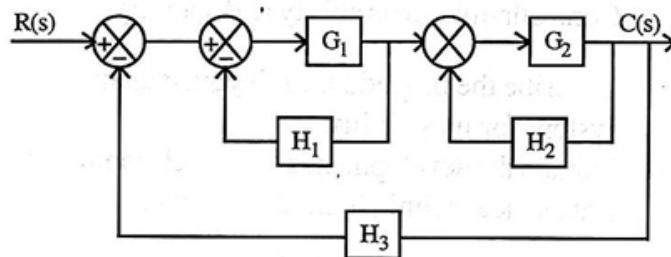2. a) Reduce the block diagram as shown below in the exact transfer function.   7

Figure : Block Diagram

b) In a feedback control loop.

$$G(s) = \frac{s-2}{(s-1)(s+4)}; \quad C(s) = K\frac{(s+1)}{s}$$

Determine the real value of K, if exists, such that the control loop is stable.   7

3. a) Explain variable structure control with suitable example.   7
   b) Give the application with necessary explanation of variable structure control.   7

4. Explain the Lyapunov based control function regarding the non linear dynamic control system.   14

5. a) Derive and explain the Euler-Lagrange equations for optimal control calculations.   7
   b) Describe the Pontryagin's maximum principle for optimal control solutions.   7

6. a) Explain the effects of load disturbance upon the control actions.   7
   b) Explain with suitable example necessary and sufficient condition for arbitrary pole placement.   7

7. Write a short note on (any two) :   7 each
   a) Transversal condition Bolza problem
   b) Lyapunov stability analysis
   c) Controllability operability and stability

8. a) Describe the procedure for Nyquist analysis of a control system for its stability.   7
   b) Explain the development of feedback control laws through state space technique modal control.   7

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