Hall Ticket No | | | | | | | | | | | Question Paper Code: AEE009

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech IV Semester End Examinations (Regular / Supplementary) - May 2019

Regulation: IARE – R16

CONTROL SYSTEMS

Time: 3 Hours **(Common to ECE | EEE)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Compare closed loop control system with open loop control system. **[7M]**
   (b) Obtain the transfer function for the given mechanical system shown in Figure 1. **[7M]**

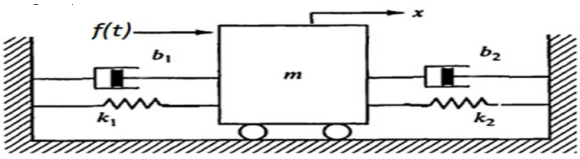

Figure 1

2. (a) How mechanical translational and rotational systems are modeled by ideal elements? Briefly discuss. **[7M]**
   (b) Human being is an example of closed loop system. Justify your answer? **[7M]**

UNIT – II

3. (a) Deduce the transfer function for armature control of DC Servo motor. **[7M]**
   (b) Find the transfer function for the block diagram shown in Figure 2. **[7M]**

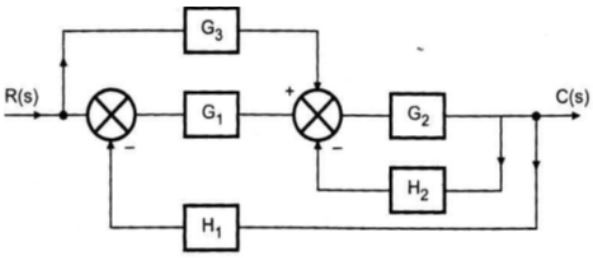

Figure 2

4. (a) Explain briefly about Mason's gain formula? What are the advantages of signal flow graph over block diagram technique? **[7M]**

   (b) Obtain the transfer function for the signal flow graph, shown in Figure 3 **[7M]**

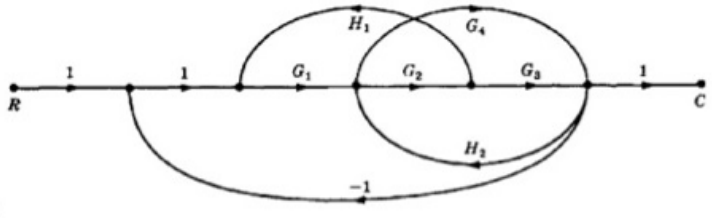

Figure 3

UNIT – III

5. (a) Discuss about the special cases while checking stability in Routh-Hurwitz criterion with an example. **[7M]**

   (b) Check the stability of the given characteristic equation using Routh's method? **[7M]**
   $S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16S + 16 = 0$

6. (a) Define the terms (i) Absolute stability (ii) Marginal stability (iii) Conditional stability **[7M]**

   (b) Draw the root locus plot for G(S)H(S)=K/S(S+1)(S+3) and comment on stability. **[7M]**

UNIT – IV

7. (a) What is frequency response? What are advantages of frequency response analysis? **[7M]**

   (b) Sketch bode plot of a system G(s) * H(S)=1/((1+s)(1+2s)) **[7M]**

8. (a) Define the following terms i) Gain cross over frequency ii)Resonant peak iii)Resonant frequency **[7M]**

   (b) Calculate the resonant peak and resonant frequency for the system whose transfer function is C(S)/R(S)=5/S^2+2S+5 **[7M]**

UNIT – V

9. (a) Explain the state variable and state transition matrix and write shot notes on formulation of state equations. **[7M]**

   (b) Determine the output of the system with zero initial state $\dot{X} = \begin{pmatrix} 2 & 0 \\ 0 & 4 \end{pmatrix} X + \begin{bmatrix} 1 \\ 1 \end{bmatrix} U$,
   $Y = [4\ \ 0]$X excited through unit impulse input. **[7M]**

10. (a) Write short notes on canonical form of representation. List its advantages and disadvantages? **[7M]**

    (b) Design a lead compensator for the system with open loop transfer function $G_f = \frac{K}{S(1+0.1S)}$ for the specifications, $K_a = 10$ and $\phi_{PM} = 30^0$. **[7M]**

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