R18

Time: 3 Hours   **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
     ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.
     iii) In Part B, Answer any one question from each unit. Each question carries 10 marks
        and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)   What is the difference between a open loop control and a closed loop control system?
                                                                                 [2]
   b)   Why negative feedback is invariably preferred in a closed loop system?   [3]
   c)   State final value of theorem.   [2]
   d)   What are standard input signals?   [3]
   e)   Define phase margin?   [2]
   f)   Write the relation between time and frequency response?   [3]
   g)   What is transient accuracy?   [2]
   h)   What are the specifications in frequency domain analysis?   [3]
   i)   Explain the solution of state equation?   [2]
   j)   Define state space model?   [3]

PART – B

(50 Marks)

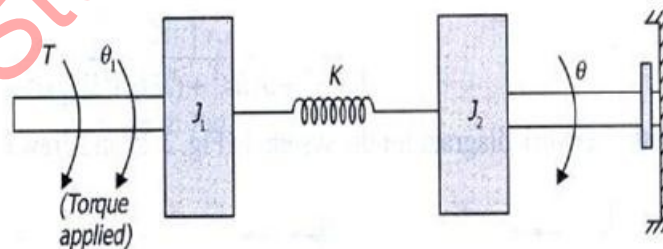2.   Find the transfer function $\theta(s)/T(s)$ of the following system shown in figure 1. [10]

Figure.1

OR

3.   Using block diagram algebra, find C(s)/R(s) for the following figure 2.   [10]
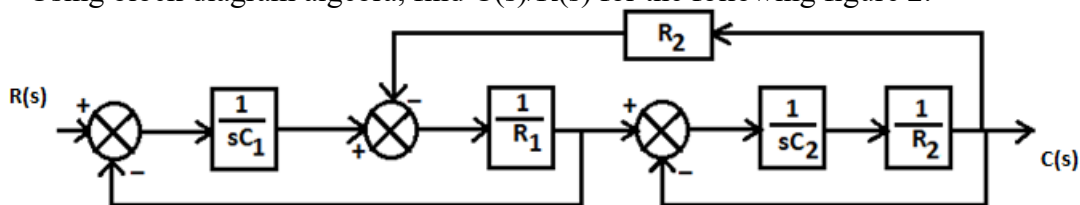

Figure 2

4.a) Explain the various rules for construction of root loci.
 b) Obtain the range of values of K for which the system with closed loop transfer function is stable [5+5]

$$G(S)H(S) = \frac{K(S+9)}{S^2(S+7) + (S+5)}$$

OR

5.a) Define the following terms:
   i) Absolute stability
   ii) Marginal stability
   iii) Conditional stability.
 b) By means of RH criterion determine the stability of the system represented by the characteristic equation $S^4 + 2S^3 + 9S^2 + 8S + 4 = 0$. [5+5]

6. Using bode plots, determine the stability of the unity feedback control system with the following open loop transfer function. [10]

$$\frac{C(s)}{R(s)} = \frac{3}{s(s+1)(s+5)}$$

OR

7. Using the Nyquist Plot, determine the stability of a unity feedback control system of

$$G(s) = \frac{9}{S^2(S+6)}$$

[10]

8.a) Explain about integral and derivative controllers with neat sketch.
 b) Explain about the analog and digital implementation of controllers. [5+5]

OR

9.a) What is a Lag compensator? Realize the lag compensator with the help of basic electrical components and thus draw its frequency response.
 b) Briefly explain the design of feedback controller using root locus technique. [5+5]

10. Write short notes on the following:
   a) Controllability and observability
   b) State Transition matrix
   c) Discrete Time systems [4+3+3]

OR

11.a) Explain in detail about diagonalization of state matrix.
  b) Obtain the state space representation of the following differential equation

$\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + y = u$, where y is the output and u is the input. [4+6]

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