

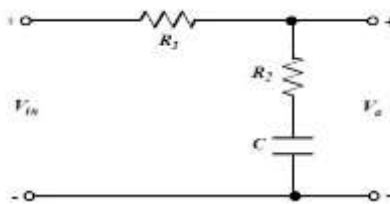
Duration: 3hrs

[Max Marks:80]

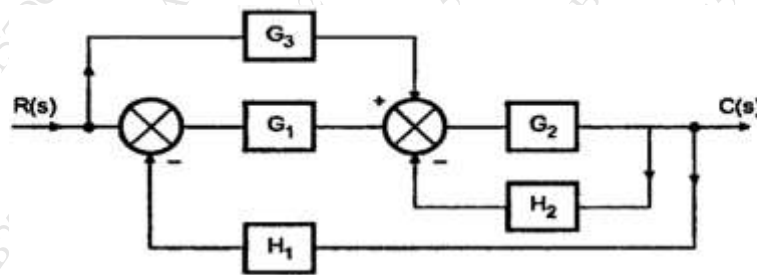
- N.B.: (1) Question No 1 is Compulsory.  
 (2) Attempt any three questions out of the remaining five.  
 (3) All questions carry equal marks.  
 (4) Assume suitable data, if required and state it clearly.

**1 Attempt any FOUR [20]**

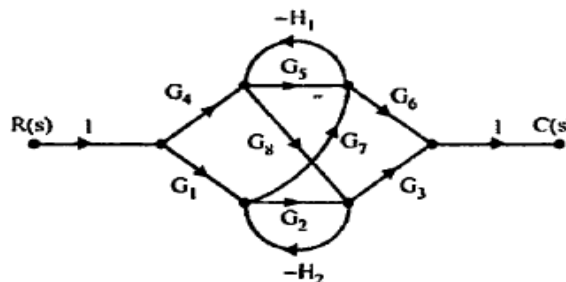
- a Discuss static and dynamic characteristics of instruments. [5]
- b Draw and discuss Maxwell bridge and its application for measurement of inductance. [5]
- c What is Impulse response of a system? If Impulse response of a certain system is  $e^{-5t}$ . Find out transfer function of this system. [5]
- d Define rise time, peak time, maximum overshoot, Delay time, Settling time [5]
- e Compute the transfer function of the given Lag network. [5]



- 2 a Explain with neat diagram principle, construction and working of Strain gauge. Define and derive Gauge factor. [10]
- b Determine the overall transfer function  $C(S)/R(S)$  for the system shown below using block diagram reduction method. [10]



- 3 a For the Signal flow graph shown below, determine the transfer function  $C(S)/R(S)$  using Mason's gain formula. [10]



- b A second order system has a unity feedback and open loop transfer function [10]

$$G(s) = \frac{500}{s(s+15)}$$

- i) Calculate  $T_p$ ,  $M_p$  and  $T_s$  for system output response when system is excited by unit step input.
- ii) Sketch transient response for unit step input.
- iii) If input is ramp of 0.5 rad/sec, calculate steady state error.

- 4 a Compare the temperature transducers RTD, thermistors and thermocouples on the basis of principle, characteristics, ranges and its applications. [10]

- b Draw the polar plot for the transfer function  $G(s) = \frac{10}{(s+2)}$ . [10]

- 5 a Plot the root locus for a unity feedback control system has an open loop transfer function [10]

$$G(s) = \frac{K}{s(s+1)(s+3)(s+4)}$$

- b Sketch the Bode plot for the unity feedback control system [10]

$$G(s) = \frac{10}{s(s+1)(s+5)}$$

Determine the gain and phase margin.

**6 Attempt any FOUR**

- a What are the three types of compensators? Explain uses of all three compensators. [5]

- b Write a short note on thermocouple. [5]

- c Write a short note on stability analysis using Nyquist Criteria. [5]

- d Use the Routh's stability criterion to determine the range of K for a unity feedback system whose open loop transfer function is [5]

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

- e Write a short note on steady state errors in feedback control system. [5]

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