



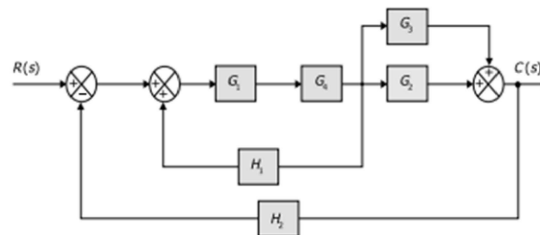
	InSem Examination-IISummer2024		
	Exam Seat No.:		
	Academic Year:2023-2024	Semester:IV	
	Name of Programme: SY B.Tech (E&TC)	Pattern:2022	
	Name of Course:Control Systems	Course Code:ETC222014	
	Max. Marks:30	Duration:1 Hr	

**Instructions:** Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 02 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

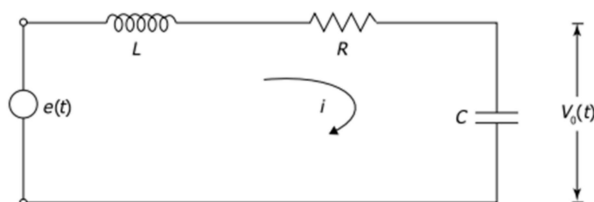
**Question No. 1 Attempt following Question**

- a) Reduce the block diagram as shown in Fig. into canonical form and determine its transfer function. (7) CO1



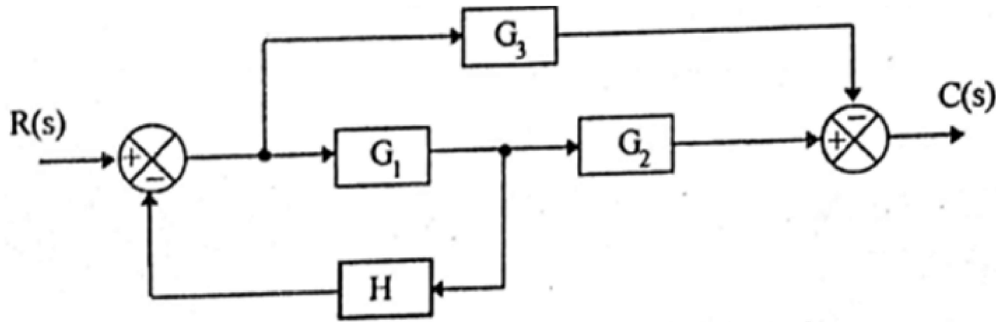
**OR**

- b) What are the basic components of control system? Derive the expression for transfer function of closed loop feedback system. (7) CO1
- c) Define transfer function. Find the transfer function of the network shown in Fig. 2 below: (8) CO1



**OR**

- d) Convert the Given Block Diagram to Signal Flow Graph and Determine  $C(S)/R(S)$ . (8) CO1



**Question No. 2 Attempt following Question**

- a) By means of Routh Hurwitz criteria, determine the stability of the system represented by the following characteristic equation. Comment on its stability. (7) CO2

$$s^4 + 2s^3 + 10s^2 + 20s + 5 = 0$$

OR

- b) The characteristic equation of a feedback control system is found as  $s^4 + 9s^3 + 11s^2 + 6s + K = 0$ . Determine the value of  $K$  for which the system is absolutely stable and marginally stable. Also determine the frequency of sustained oscillation. (7) CO2

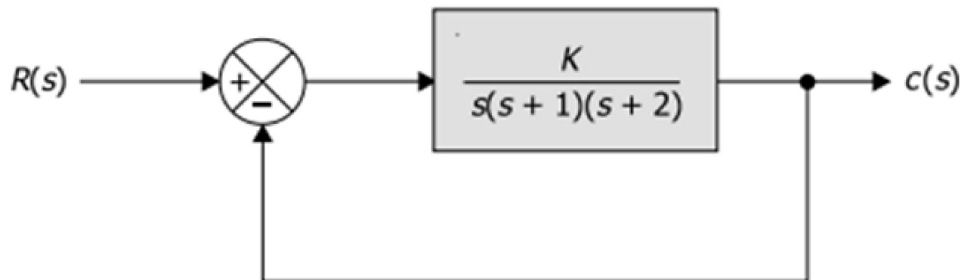
- c) Consider a system with the transfer function (8) CO2

$$G(s) = \frac{(s+2)(s^2+4s+5)}{(s+3)(s+5)}$$

1. Determine the poles and zeros of the given transfer function.
2. Sketch the pole-zero plot for the system.
3. Discuss the stability of the system based on the pole locations.
4. Explain how changes in the pole and zero locations might affect the system's behavior.

OR

- d) A block diagram representation of a unity feedback control system is shown below. For this system sketch the root locus. Also determine the value of  $K$  so that the damping ratio, of a pair of complex conjugate closed loop poles is 0.5. (8) CO2



XXXXXXXXXXXXXXXXXXXXXXXXXXXX