Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (R,S) Examination November 2025 (2019 Scheme)

Course Code: MRT303

Course Name: LINEAR CONTROL SYSTEMS

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer all questions; each question carries 3 marks) **Marks**

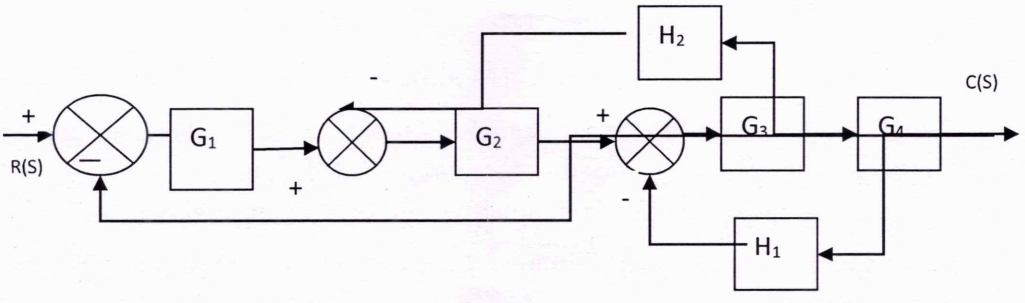
1	"Negative feedback is invariably preferred in a closed system". Justify the statement.	(3)
2	Classify control systems based on control action. Explain it.	(3)
3	State D'Alembert's principle. Mention any one application.	(3)
4	Explain an analogous system with an example.	(3)
5	Label different time domain specifications of a control system. Explain any two.	(3)
6	Comment on the nature of roots of different second order control systems.	(3)
7	What are break in and break away points? How to determine it.	(3)
8	What would happen if a pole is adding on root locus?	(3)
9	How will you choose series and parallel compensation?	(3)
10	Discuss the pros and cons of proportional controller.	(3)

PART B

(Answer one full question from each module, each question carries 14 marks)

Module -1

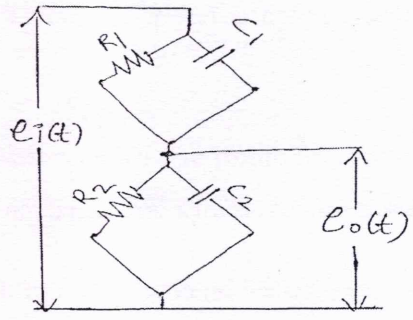
11 a) Convert the given below to signal flow graph and find the transfer function of the system using Mason's gain formula. (10)



b) What is the effect of positive feedback on stability? (4)

12 a) List the basic properties of signal flow graph. (4)

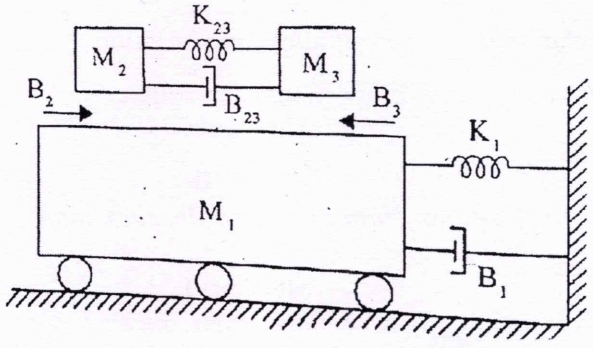
b) Perform mathematical modelling on the electrical network shown below. Express the transfer function in the form $\frac{E_0(S)}{E_i(S)} = K\frac{(1+ST_1)}{(1+ST_2)}$



Module -2

13 a) Draw equivalent circuit of field-controlled DC motor and show the transfer function in time constant form (7)

b) Write the differential equation governing the mechanical system shown below. (7)



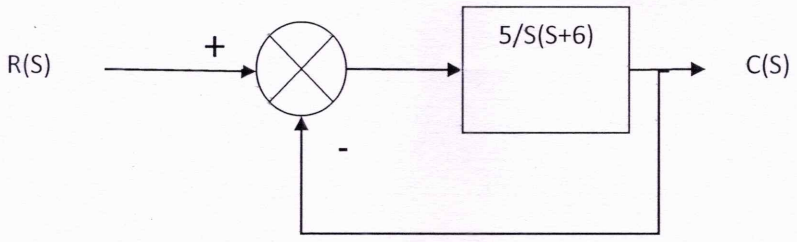
14 a) Obtain the transfer function and develop the block diagram of armature controlled DC motor. (14)

Module -3

15 a) What are standard test input signals? Prepare a table showing mathematical expression and laplace transform of important test signals (5)

b) Plot the step response of underdamped second order control system (9)

16 a) A positional control system is shown below. What will be response of the system for step input? (9)



b) How can you describe steady state error? Define static error constants. (5)

Module -4

17 a) Sketch the root locus for unity feedback control system whose open loop transfer function is , (14)

$$G(s) = \frac{K(s^2 + 6s + 25)}{s(s+1)(s+2)}$$

Determine the poles at imaginary axis.

18 a) Sketch the bode plot for the following transfer function .Determine phase margin. (14)

$$G(s) = \frac{75(1 + 0.2s)}{s(s^2 + 16s + 100)}$$

Module -5

19 a) Illustrate the working of automatic temperature control system inside a vehicle. (14)

20 a) Differentiate between lag and lead compensators. (8)

b) Elaborate on PID tuning methods. (6)

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