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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree (R, S) Examination November 2024 (2019 Scheme)

Course Code: MRT 303

Course Name: LINEAR CONTROL SYSTEMS

Max. Marks: 100 Duration: 3 Hours

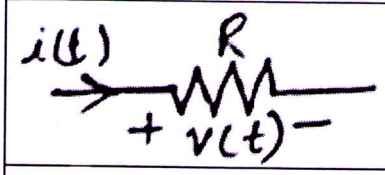
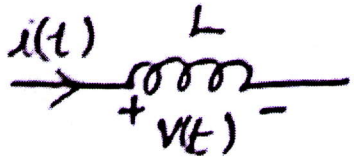
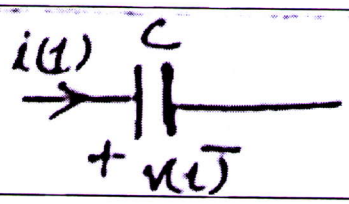
(Graph sheet, Polar groph sheet, Semi-log groph sheet are to be provided)

PART A

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

1 Distinguish between open loop and closed loop system 3

2 Write down the Dynamic Equations using KCL and KVL of RL,RC Circuits. 3

ELEMENT	VOLTAGE ACROSS THE ELEMENT	CURRENT THROUGH THE ELEMENT
		
		
		

3 State D'Alembert's principle. Explain with an example. 3

4 State the Analogous elements in Force-voltage analogy for mechanical rotational systems. 3

5 Write about standard test signals. 3

6 Write about steady state error. 3

7 What is Bode plot? Mention the advantages of bode plot. 3

8 Write about Routh-Hurwitz stability criterion. 3

9 Write about Lag compensator. How S-plane is represented in Lag compensator. 3

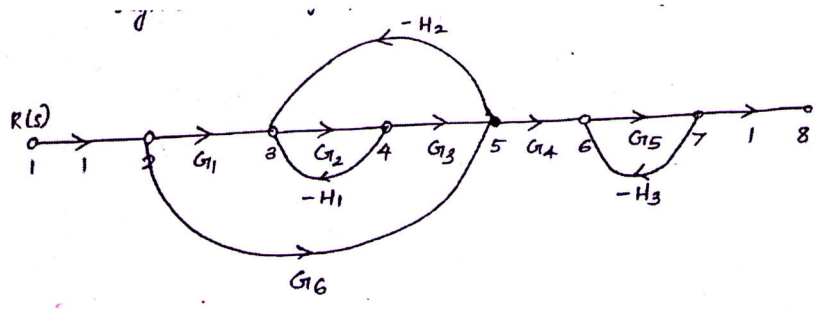
10 Explain about Automatic traffic light control. 3

PART B

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

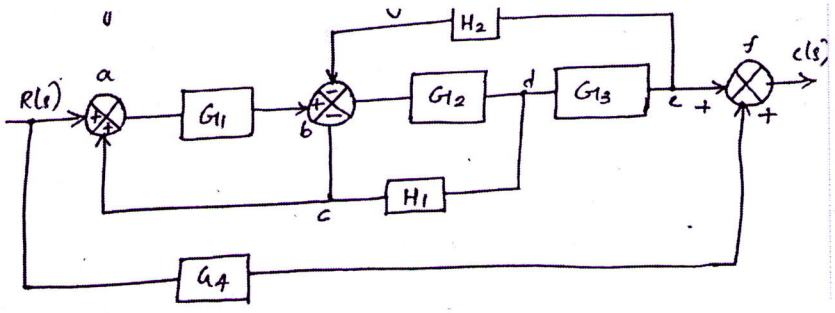
Module -1

11 a) Find the overall transfer function of the system whose signal flow graph is given below. 10



b) Write the Mason's gain Formula. 4

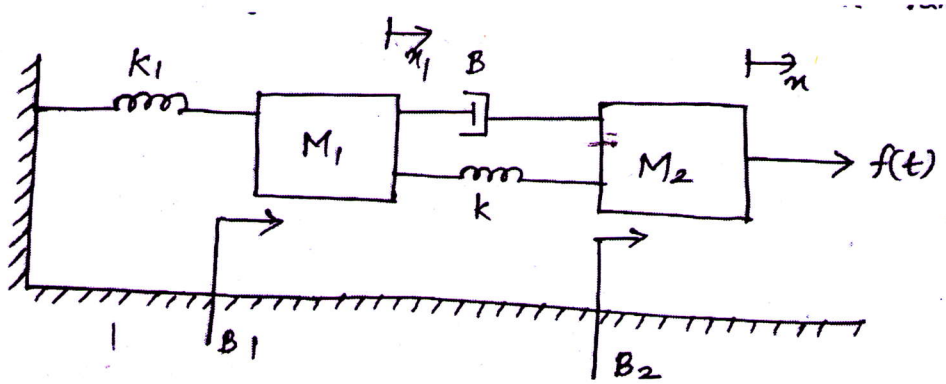
12 a) Obtain the closed loop transfer function of the system C(S)/R(S) of the system. 10



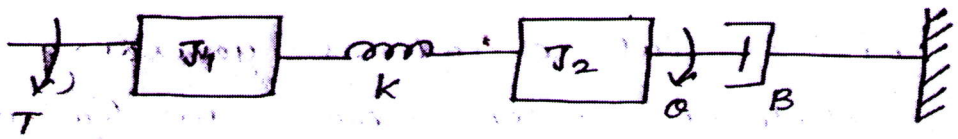
b) How we can Eliminate positive and negative feedback from a loop using block diagram reduction method. 4

Module -2

13 a) Write the differential Equations governing the mechanical system shown in figure and determine the transfer function. 10

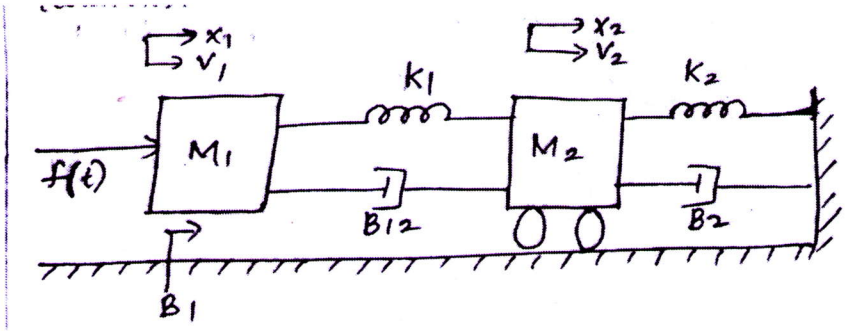


b) Write the differential equations governing the mechanical rotational system shown in fig given below. Obtain the transfer function of the system. 4



14 a) Determine the transfer function of an armature controlled DC motor. 7

b) Write the differential equations governing the mechanical system shown in fig. Draw the force voltage and force current electrical analogous circuits and verify by writing mesh and node equations. 7



Module -3

15 a) With necessary equations explain in detail about Response of underdamped second order system for step input. 10

b) Define delay time and rise time. 4

16 a) With necessary equations explain in detail about Response of over damped second order system for step input. 10

b) Define peak time and peak overshoot time. 4

Module -4

17 a) Plot the Bode diagram for the transfer function given below obtain the gain and phase cross over frequencies. 14

$G(s)=10/s(1+0.4s)(1+0.1s)$

18 a) How we can determine gain margin and phase margin from polar plot. 6

b) Explain in detail about frequency domain specifications. 8

Module -5

19 a) Explain in detail about PID controllers with neat sketch diagrams if necessary. 10

b) How automatic light control system is been used in control system. 4

20 a) Explain in detail about Lead and Lag compensators. 10

b) What is the role of control system in mechatronics? 4

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