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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S,FE) Examination May 2025 (2019 Scheme)

Course Code: MRT 303

Course Name: LINEAR CONTROL SYSTEMS

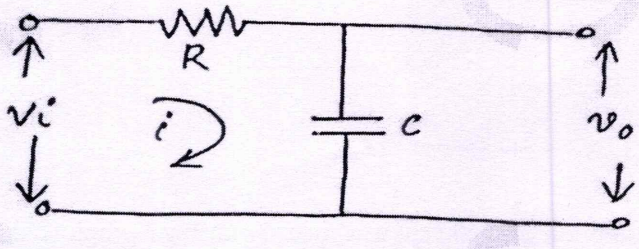
Max. Marks: 100 Duration: 3 Hours

(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 Determine the dynamic equations and transfer function of the given RC Networks 3



2 How a positive and negative feedback is been eliminated in block diagram reduction method. 3

3 Write the differential Equations for Mass, Spring and Dashpot elements in Modelling of translational systems. 3

4 Write the Torque-Balance equations for idealised elements in Mechanical Rotational systems. 3

5 Write about standard test signals step and ramp signals. 3

6 Write about Rise time .Also write Expression for rise time. 3

7 Explain about gain margin and phase margin. 3

8 How is stability related to location of poles. 3

9 What is the role of control system in mechatronics. 3

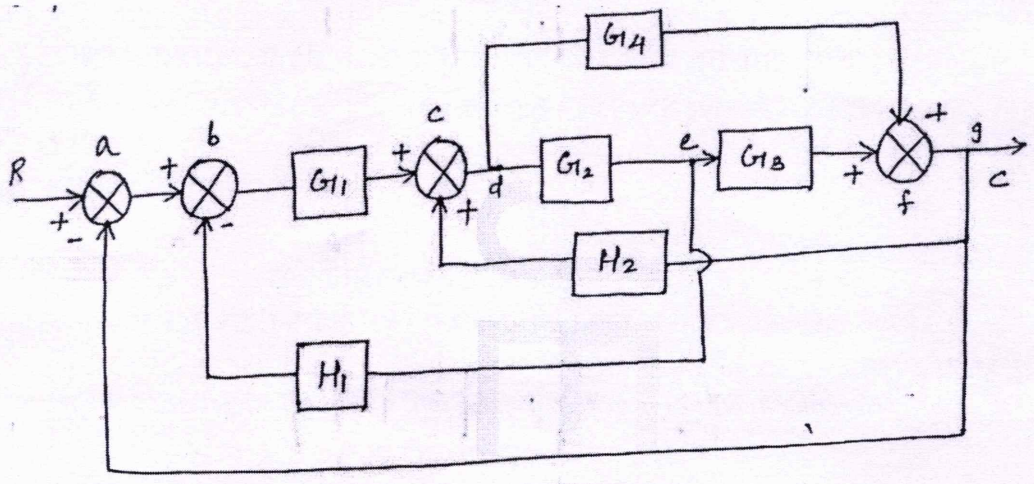
10 How lead and lag compensator is represented in S-plane. 3

PART B

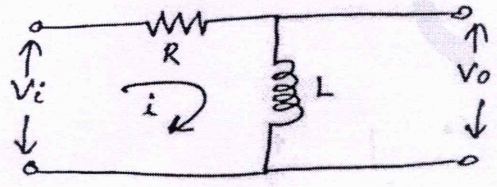
(Answer one full question from each module, each question carries 14 marks)

Module -1

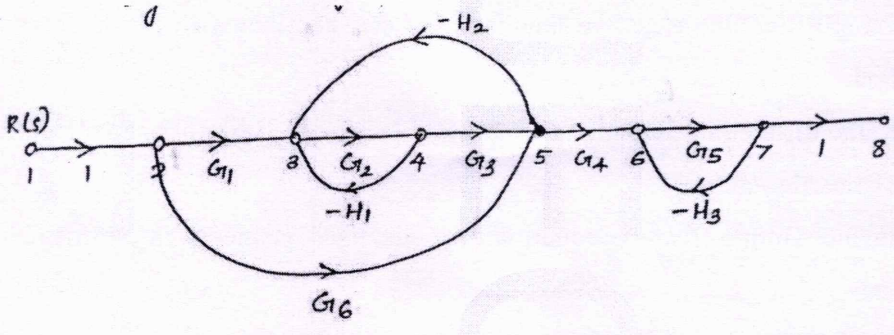
11 a) Using block diagram reduction method find the closed loop transfer function of the system Shown in figure below. 8



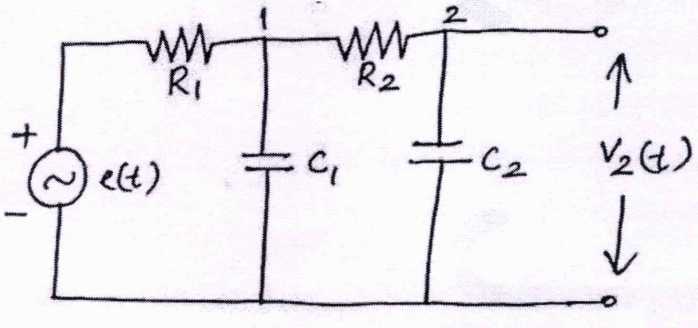
b) Determine the dynamic equation and transfer function of the RL circuit given below. 6



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



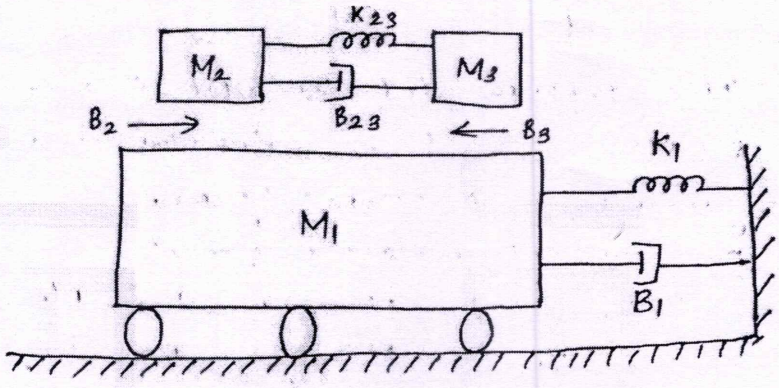
12 b) Obtain the dynamic equations of the electrical network shown in figure. 4



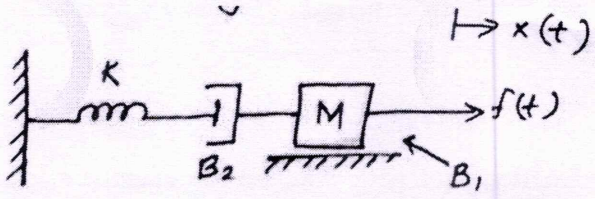
Module -2

13 a) Write the differential equation governing mechanical systems shown in fig. Draw the force-voltage and force-current electrical analogous circuits and verify by writing mesh 10

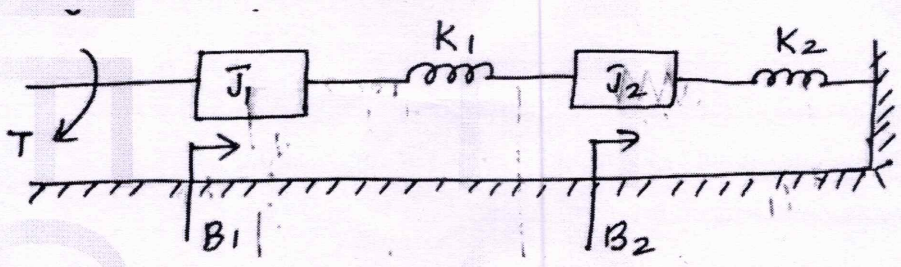
and node equations



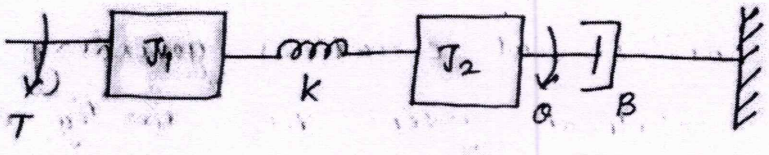
13 b) Write the equations of motion in S-domain for the system given in figure below. 4



14 a) Write the differential equations governing the mechanical rotational systems shown in fig. Draw the torque-voltage and torque-current electrical analogous circuits and verify by writing mesh and node equations. 10



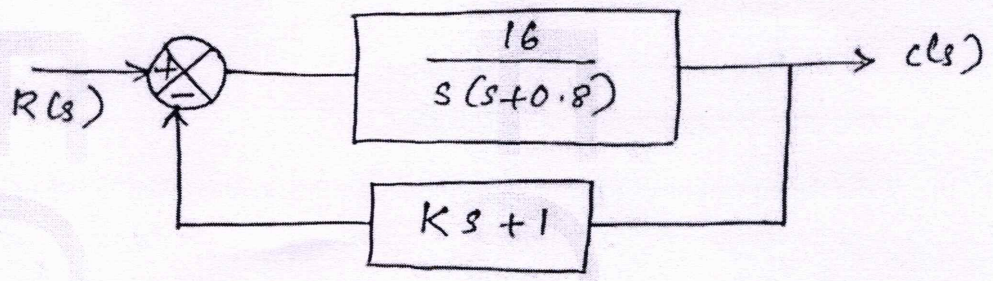
14 b) Write the differential equations governing the mechanical rotational systems shown in figure.obtain the transfer function of the system. 4



Module -3

15 Explain in detail about the time domain specifications in control system with necessary derivations and equations. 14

16 A positional control system with velocity feedback is shown in fig below. What is the response C(t) to the unit step input. Given that $\delta = 0.5$ .calculate the rise time, peak time,maximum overshoot and settling time. 14



Module -4

17 For the following transfer function draw bode plot and obtain gain cross over frequencies G(s)=20/s(1+3s)(1+4s). 14

18 The open loop transfer function of a unity feedback system is given by G(s)=1/s(1+s)(1+2s).sketch the polar plot and determine the gain margin and phase margin . 14

Module -5

19 a) Explain detail about PI and PD controllers. 8

b) Write in detail about cascade and feedback compensation. 6

20 a) How tuning of PID controllers is done? 8

b) Write about Automatic street light control. 6

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