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(Revision – 2021)

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER – 2023

CONTROL ENGINEERING

[Maximum Marks: **75**] [Time: **3** Hours]

PART-A

I. Answer *any five* questions from the following. Each question carries'3' marks.

(5 x 3= 15 Marks)

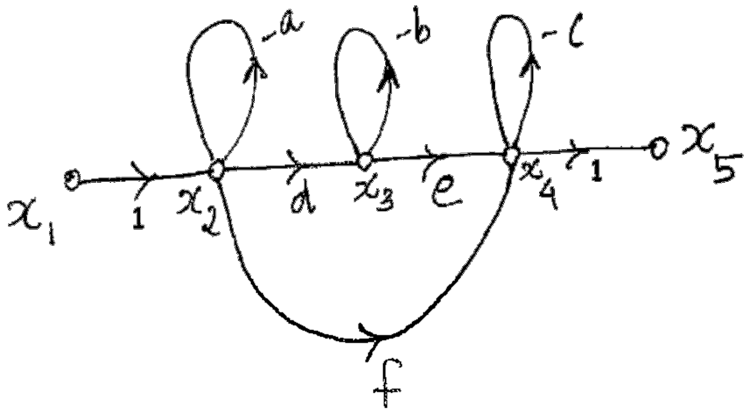
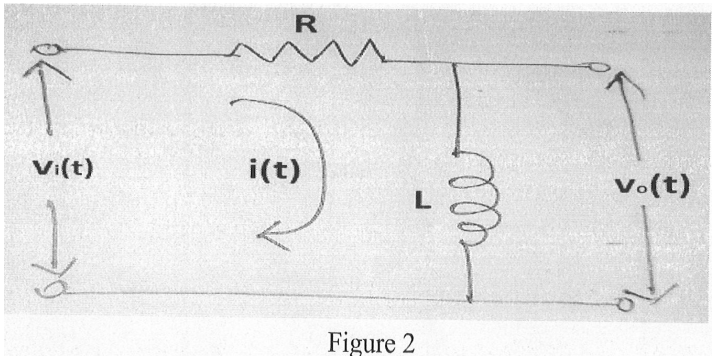
		Module Outcome	Cognitive level
1.	Define laplace transform. Write the laplace transform of the function f(t)= t.	M1.03	R
2.	State initial value theorem and final value theorem.	M1.01	U
3.	State Mason's gain formula.	M2.04	R
4.	List the static error constants.	M3.02	R
5.	Draw the elements used to model mechanical translational systems.	M2.02	U
6.	What is transient response and steady state response?	M3.01	U
7.	Define absolute stability and relative stability.	M4.01	U

PART-B

Answer all questions from the following. Each full question carries *'15'* marks.

(4 x 15 = 60 Marks)

		Module Outcome	Cognitive level
II.	(a) Write any 6 comparisons on open loop and closed loop control systems. (6 marks)	M1.01	U
	(b) Derive the laplace transform of function f(t)= e^{-at} (9 marks)	M1.03	R
	OR		
III.	(a) Find the inverse laplace transform of F(s)=$\frac{s+3}{(s+6)(s+4)}$ (7 marks)	M1.04	A
	(b) Solve the following differential equation (8 marks) $\frac{dx(t)}{dt} + 3x(t) = e^{-t}$, provided x(0)=0	M1.04	A

IV.	(a) Describe force -voltage analogy. (8 marks) (b) Find $\frac{x_5}{x_1}$ from the following signal flow graph shown  (7 marks)	M2.03 M2.04	A A
	OR		
V.	(a) Explain any 8 block diagram reduction rules. (8 marks) (b) Find the transfer function of the circuit shown in figure 2, if $v_i(t)$ is the input applied and $v_0(t)$ is the output of the system.  Figure 2 (7 marks)	M2.04 M2.04	U A
VI.	(a) Determine the time response of first order system for unit step input. (8 marks) (b) Derive the steady state error of a type 1 system for unit ramp input. (7 marks)	M3.01 M3.03	U U
	OR		

VII.	a) Explain standard second order system with block diagram and transfer function. Write shortly about different types of damping. (8 marks) b) Open loop transfer function of a unity feedback system G(s)H(s)= $\frac{10(s+2)}{s^2(s+1)}$. Find steady state error for a unit parabolic input. (7 marks)	M3.01 M3.03	U A
VIII.	a) Sketch the bode plot G(s)=K. (6 marks) b) Write the procedure to construct Root locus. (9 marks)	M4.03 M4.04	U R
	OR		
IX.	a) Characteristic equation of a system is given as: $S^4 + 8S^3 + 18S^2 + 16S + 5 = 0$. Determine the stability of system using Routh Hurwitz stability criterion and comment on the location of roots. (9 marks) b) Define gain margin and phase margin. (6 marks)	M4.02 M4.03	A U

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