TED (21) 3084

(Revision-2021)

N22-2110220073A

Reg.No.....

Signature.....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, NOVEMBER - 2022

CONTROL ENGINEERING

[Maximum marks: 75] (Time: 3 Hours)

PART A

I. Answer any FIVE questions from the following. Each question carries 3 Marks.

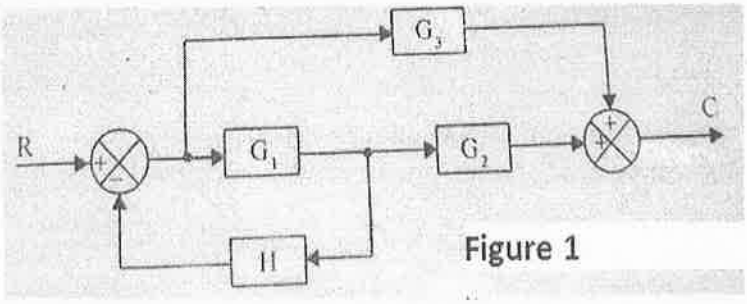
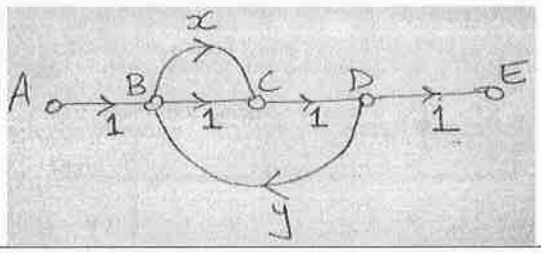
(5 x 3 = 15 Marks)

		Module outcome	Cognitive level
1	State real integration theorem and real differentiation theorem	M1.03	R
2	Write the laplace transform of the following functions (i)sin(at) and (ii)cos(at).	M1.03	R
3	Define node and branch used in signal flow graphs	M2.04	R
4	Explain impulse signal	M3.01	U
5	Draw a dash pot used to model a mechanical translational system. Obtain the mathematical model of the dashpot.	M2.02	U
6	$G(s)H(s)=\frac{5}{s^2(s+1)}$ Find acceleration error constant, Ka	M3.02	A
7	Characteristic equation is given by $9S^6 + 5S^5 + S^4 + 2S^2 + S + 4 = 0$. Construct the first 2 rows of Routh Array.	M4.02	U

PART B

Answer all questions. Each full question carries 15 marks. **(4 x 15 = 60 Marks)**

			Module outcome	Cognitive level
II	(a)Describe linear time invariant and linear time variant system	(5Marks)	M1.02	R
	(b)Solve the following differential equation $\frac{dx(t)}{dt} - x(t) = e^{3t}$, if x(0) =0	(10 Marks)	M1.04	A
	OR			
III	(a)Find the inverse laplace transform of $F(s) = \frac{2}{(s+1)(s+2)}$	(8 Marks)	M1.04	A
	(b) Obtain the laplace transform of function $f(t) = e^{at}$.	(7 Marks)	M1.03	U
IV	(a)Describe force-current analogy.	(8 Marks)	M2.03	U

	(b)Reduce the block diagram shown in figure 1 and find $\frac{C}{R}$ (7 Marks)  Figure 1	M2.04	A
	OR		
V	(a)Explain any 7 block diagram reduction rules (7 Marks) (b)Find $\frac{E}{A}$ from the signal flow graph shown. (8 Marks) 	M2.04 M2.04	U A
VI	(a)Determine the response of a first order system to a unit impulse input and draw the response curve. (9 Marks) (b)Derive the steady state error of a type 0 system with unit step input. (6 Marks)	M3.01 M3.03	U U
	OR		
VII	(a)Transfer function = $\frac{10}{s^2+2S+10}$ Write the characteristic equation and find natural frequency, damping ratio, damped frequency of oscillation. Comment about the damping of the above system. (8 Marks) (b) Derive steady state error of a type 1 system with unit ramp input. (7 Marks)	M3.01 M3.03	A U
VIII	(a)Define the terms: (i)Root locus (ii)Absolute stability (iii) asymptotes (iv)centroid (8 Marks)	M4.04	U
	(b) Draw the bode plot of 1 + sT (7 Marks)	M4.03	U
	OR		
IX	(a)Characteristic equation of a system is given as: $3S^4+10S^3+5S^2+5S+2=0$. Construct the Routh array and find the location of roots. Comment on the stability of the system. (7 Marks) (b) Write the procedure to construct root locus (8 Marks)	M4.02 M4.03	A R

****