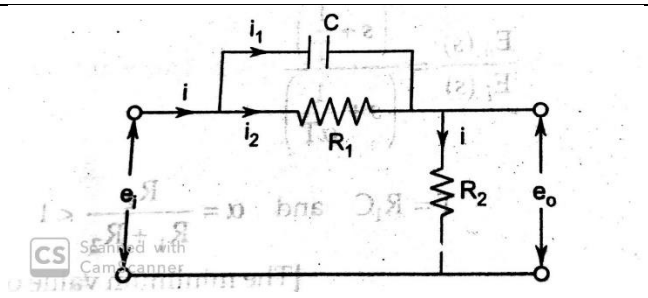
Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2020

Course: Mathematical Modelling and Simulation **Semester: VIII**
Program: B.Tech ASEA **Time 03 hrs.**
Course Code: AVEG 452 **Max. Marks: 100**

Instructions: solve the problems mentioned and provide the values where ever necessary

	SECTION A		
1	Laplace transform of integral of f(t) is _____.	**5**	
2	The torque T1 is transferred from a gear with N1 teeth to gear with N2 teeth, the value of the torque received at the shaft of second gear is _____.	**5**	
3	The value of damping ratio of 0.6 in the step response of a second order system results in the maximum overshoot of _____.	**5**	
4	The unit step response of second order underdamped system exhibits the peak overshoot of 15%. If the magnitude of the input is doubled, the peak overshoot will be _____.	**5**	
5	The characteristic equation of a unity feedback control system is described by $2s^2 + 3s + 5 = 0$. the steady state error due to unit ramp input will be ____.	**5**	
6	For a matrix A = $\begin{bmatrix} 1 & 4 \\ -2 & -5 \end{bmatrix}$ the eigen values will be _____.	**5**	
	SECTION B		
7	Differentiate between feedback and feed forward system Or Differentiate between lead and lag compensators	**10**	
8	Describe the following with respect to stability a. Absolute stability b. Conditional stability c. Relative stability	**10**	
9	The electrical network for lead compensator is shown below, determine T and α for the networks	**10**	

			
10	Express the given complex function in pole-zero form. Identify the zeros and poles $$G(s) = \frac{5s + 6}{s(s + 7)^2(10s + 3)}$$	**10**	
11	Write steps involved in developing mathematical model		
	SECTION-C		
12	A unity feedback control system has an open loop transfer function $$G(s) = \frac{k}{s(s^2 + 4s + 13)}$$ Using the root locus plot of the system, determine the following (**<u>give values</u>**): a. Centroid, number and angle of asymptotes b. Angle of departure of root loci from the poles c. Breakaway points if any d. Value of k and the frequency at which the root loci cross the jω axis **Or** A feedback aircraft pitch dynamics control system is shown below. $$P(s) = \frac{\Theta(s)}{\Delta(s)} = \frac{1.151s + 0.1774}{s^3 + 0.739s^2 + 0.921s}$$ Calculate the following: 1. Obtain closed loop steady state response with pitch angle reference is a 0.2 radian (11 degree) step 2. In the rootlocus plot give the following values: a. Centroid, number and angle of asymptotes b. Angle of departure of root loci from the poles c. Breakaway points if any	**20**	