Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Flight Dynamics and Control **Semester: VI**
Program: B.Tech ASE+AVE **Time : 03 hrs.**
Course Code: ASEG 3015 **Max. Marks: 100**

Instructions: Use graph sheets for root locus plot.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Derive rigid body equation of yawing motion of aircraft.	**4**	**CO1**
Q 2	Compare different types of Inputs that can be used to analyse dyamic response fo aircraft.	**4**	**CO2**
Q 3	Differentiate between open and closed loop and control system with 2 examples for each	**4**	**CO3**
Q4	Characterize long period motion of aircraft.	**4**	**CO3**
Q5	Why marker beacons are used in glide slope beams in ILS system.	**4**	**CO4**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Show that characteristics root for spiral motion is given by $\lambda_{spiral} = \frac{L_\beta N_r - L_r N_\beta}{L_\beta}$ Hint: $\begin{bmatrix} \Delta\dot{\beta} \\ \Delta\dot{p} \\ \Delta\dot{r} \\ \Delta\dot{\phi} \end{bmatrix} = \begin{bmatrix} \frac{Y_\beta}{u_0} & \frac{Y_p}{u_0} & -\left(1 - \frac{Y_r}{u_0}\right) & \frac{g\cos\theta_0}{u_0} \\ L_\beta & L_p & L_r & 0 \\ N_\beta & N_p & N_r & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} \Delta\beta \\ \Delta p \\ \Delta r \\ \Delta\phi \end{bmatrix}$	**10**	**CO1**
Q 7	Given the Characteristics equation of aricraft is represented by	**10**	CO3

	$s^3+3s^2+3s+1+k$ Find the value of k for which the aircraft is stable.		
Q 8	Analyze the stability of the system using **Root Locus plot** where $G(s)H(s)=\frac{K(s+1)}{s(s+2)(s+3)}$ Find no. of poles and zero, starting and ending point of poles, no. of asymptotes(tangent lines) and their respective angle, intercepts (origin) of angles, crossover (points if any)	**10**	**CO3**
Q 9	Explain different functions with the help of Block diagram of ILS (Instrument Landing System).	**10**	**CO4**
SECTION-C (2Qx20M=40 Marks)			
Q 10	Derive the stability derivatives C_y, C_{nr} , C_z C_{mq} and C_m	**20**	**CO2**
Q 11	A unity feedback system with a forward transfer function *G(s)=80/s(s+2)* has a rate feedback transfer function Hs)=*as* a) Determine the damping ration and natural frequency of oscillations in the derivative feedback (*a=0*). b) Determine the value of *a* such that the damping ratio is 0.7.	**20**	**CO3**