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

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, December 2020

Course: Orbital Mechanics **Semester: VII**
Program: B. Tech ASE/ASE+AVE **Time 03 hrs.**
Course Code: ASEG 4006 **Max. Marks: 100**

Instructions: a) All questions are compulsory.
b) Assume any suitable value for the missing data
c) For man-made earth satellites use μ = 398 600 km2/s2. *RE* = 6378 km

SECTION A

S. No.		Marks	CO
Q 1	What is geosynchronous orbit? How it is different from Polar orbit?	**5**	**CO1**
Q2.	Explain the Perturbations due to Non-Spherical Earth. Justify your answer.	**5**	**CO2**
Q3	Calculate the velocity of an artificial satellite orbiting the Earth in a circular orbit at an altitude of 725 km above the Earth's surface.	**5**	**CO1**
Q4.	How deadly is the Van Allen Belt? You can write your answer with respect to space missions.	**5**	**CO2**
Q5	Explain the satellite attitude control systems used in recent space missions.	**5**	**CO3**
Q6	What do you understand by Impulsive Maneuvers? Is it useful for interplanetary missions?	**5**	**CO2**
	SECTION B		
Q 7	Use the equations of motion to show why orbiting astronauts experience weightlessness.	**10**	**CO2**
Q8.	An artificial earth satellite is in an elliptic orbit which brings it to altitude of 320 km at perigee and out to an altitude of 700 km at apogee. Calculate the velocity of the satellite at both perigee and apogee	**10**	**CO2**
Q9.	An earth satellite is in an orbit with perigee altitude z_p = 400 km and an eccentricity e = 0.6. Find (a) the perigee velocity, v_p; (b) the apogee radius, r_a; (c) the semimajor axis, a. **OR** At two points on a geocentric orbit the altitude and true anomaly are z_1 = 1545 km, θ_1 = 126◦ and z_2 = 852 km, θ_2 = 58◦, respectively.	**10**	**CO1**

	Find (a) the eccentricity; (b) the altitude of perigee; (c) the semimajor axis; and (d) the period.		
Q10.	A spacecraft is in a 600 km circular earth orbit. Calculate (a) the total delta-v required for a Hohmann transfer to a 3400 km coplanar circular earth orbit, (b) the transfer orbit time.	**10**	**CO2**
Q11.	Write the statement of Lamberts problem. Explain the application areas of Lamberts problem.	**10**	**CO3**
	SECTION-C		
Q12	Find the total delta-v requirement for a bi-elliptical Hohmann transfer from a geocentric circular orbit of 7500 km radius to one of 106000 km radius. Let the apogee of the first ellipse be 215000 km. Compare the delta-v schedule and total flight time with that for an ordinary single Hohmann transfer ellipse. **OR** Mars Orbiter Mission (MOM) is the cynosure of many of the technological breakthroughs achieved by Indian Space Research Organization (ISRO) in the Space domain. Explain the objectives of the mission, launch vehicle, scientific payloads, achievements, awards, and tracking locations.	**20**	**CO3**