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Practice 1 report

Problem 1:

In the first exercise we calculate the perturbations of the third body, these are caused by the gravitational force of the sun on the moon that cause periodic variations in all the elements of the orbit.

The first thing we have to calculate is‘n’ that is the number of revolutions per day, we calculate this as the time(one day obviously) in seconds divided by the period,then n = 24*60*60(segundos en un día) /Period.

Once we have calculated ‘n’ we calculate all the requested parameters with the given formulas, since the rest of the values are already given.

Problem 2:

1- Velocity of the satellite.

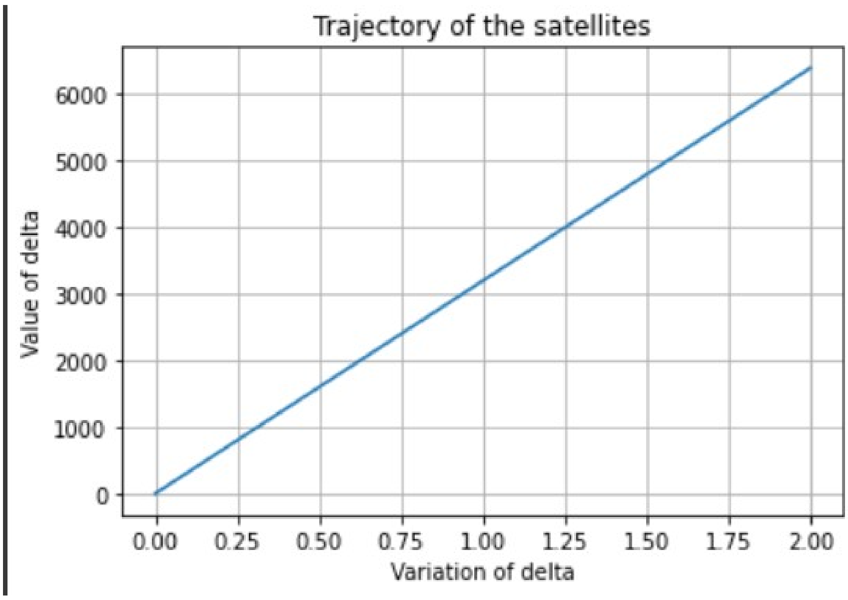
The velocity of a satellite depends on the height , since the rest of the values are the mass of the earth, the radio y G , that are constants, then, We substitute all the values in the formula: v= $(mu/a)^{0.5}$ and since the eccentricity is 0, then, a=radio, then, v= 7.7km/s, this tells us that it is a circular orbit

2- Impulse to reach a parabolic orbit.

As we saw in the previous section, the orbit of the satellite is circular, so we have to give it the necessary impulse to convert it to parabolic, for this we calculate the difference between v1, that is the speed to reach a parabolic orbit and v2, that is the value of a circular orbit . V1 = $(2*mu/r)^{0.5}$

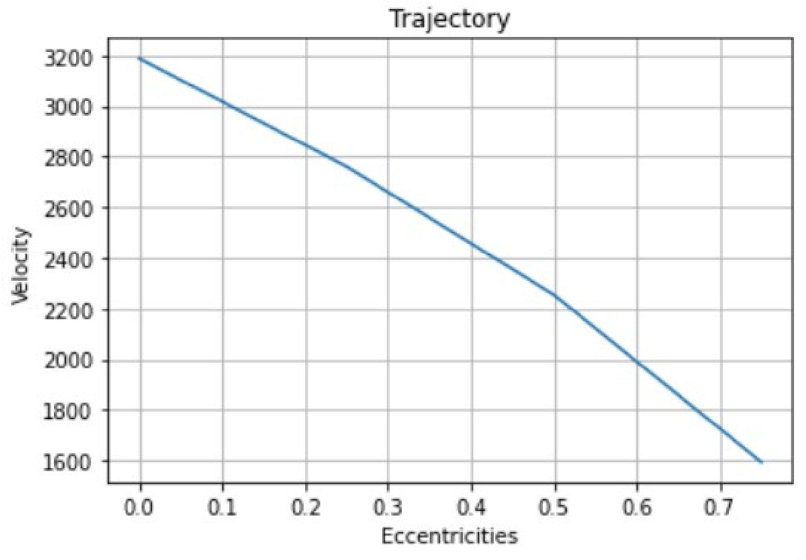
3-Plot the trajectories

Create a linear graph, in which we will vary delta value obtained in the previous section. We will vary it from 0*delta to 2*delta. Obviously the graph is an ascending line, because the only thing we do is vary delta, from zero to double its value.



3.b- Plot the trajectories with eccentricities

We draw the evolution of the speed of the satellite as in the previous exercise , but, in this case it must be taken into account that the eccentricity ,since it is not just zero entonces, thus the formulas become $v1=(2*mu*(1-e)/r)^{0.5}$ y $v2= (mu*(1-e)/r)^{0.5}$
Just looking at the formulas we realize that the trajectory decreases with eccentricity.



4- Distance and height of the geostationary orbit

To calculate the distance we use the rotation period of the earth, knowing that the earth rotates in a day 360,9856º , and that a geostationary satellite rotates 360º, we can find the relation between both and turning this into hours, we find the sideral time.

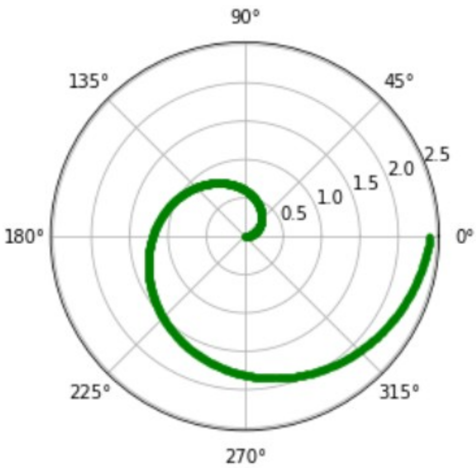
The height of a geostationary satellite is constant ,but using the formula of exercicie 1 y and using the angular velocity of the satelite, w=v/r

5-Delta v to reach the apogee

In this case they ask us for the delta to pass from the initial circular orbital to the apogee of the GEO orbit , the apogee is the point of the orbit where is the greatest distance from the center of the earth, then, we calculate delta, is the difference between v2 that is the orbital speed already calculated and v1 that is the velocity in the apogee, for that value apart from the usual distance , we must use the height of the GEO orbit

6-Plot the transfer orbit

Now we are going to make a drawing in polar of the transfer orbit, for this we use 'theta' that is the variation of the angle of the satellite from 0 to 2pi, and 't' that is the variation of delta



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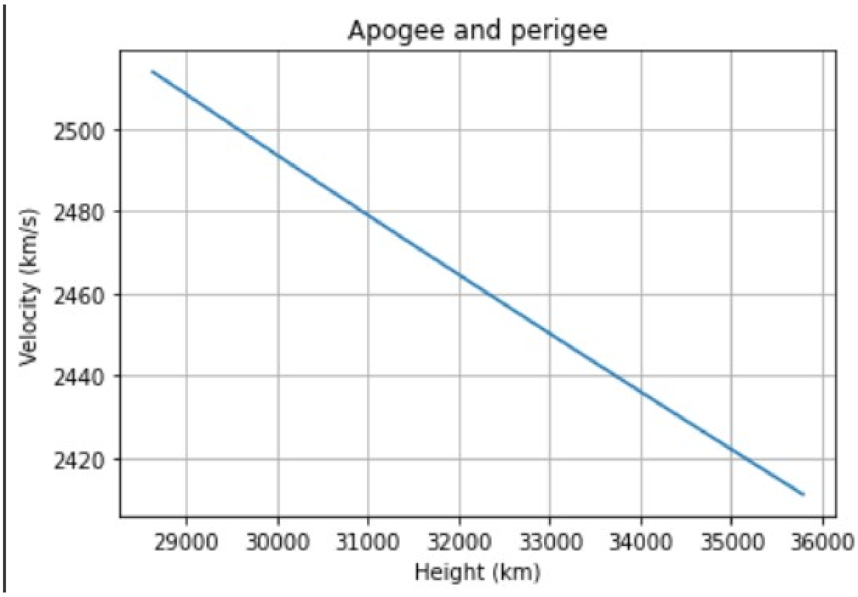
7-Plot the height and velocity marking the apogee and the perigee (VERRRR)

For this section we draw a linear graph where we vary the height and speed to reache apogee, in the formulas of height and speed ,we see that they are inversely proportional, then, higher speed lower height and vice versa



8- Deltav in the geoestationary orbit

Now we recalculate, v1is the speed in the GEO orbity and v2 is the velocity in the orbity eliptic

9- Operations for orbital transfer

Finally we calculate deltaA and deltaB, deltaA is the variation of the speed of the satellite so that it passes from the circular orbit of radio r1 to the parabolic orbit. DeltaB is the variation to go from the parabolic trajectory to the circular orbit of radius r2 (the GEO).