



Mission Design Engineer - Assignment

Question 1

Given below is the TLE of an **object** in space.

```
1 03386U 65082MY 23081.95345837 .00004143 00000-0 45959-3 0 9996
2 03386 32.3737 289.5919 0008599 302.6285 57.3541 14.86044732 69107
```

Assume that there is a space-based sensor (**tracker**) for detecting space objects in the given orbital conditions:

- Epoch = 2023-03-21 00:00:00 UTC
- SMA = 6878 km
- Inclination = 97.4 deg
- Eccentricity = 0
- RAAN = 269.8035 deg
- Arg of Perigee = 331.7425 deg
- Mean Anomaly = 0 deg
- Coordinate system : TEME

It has a camera with 30-degree field of view that points in the velocity direction. A **crossing** event is defined as when a space object geometrically passes through the 30 degree field-of-view of the camera. A crossing event does not mean the object is detected. Assume that the space object is **visible** to the camera only if it is sunlit and comes closer than 1000 km to the tracker during its crossing.

Write a python script to do the following analysis:

- Check if there are any **crossings** of the given object in the next one day starting from the given epoch of tracker. If yes, print details for each crossing event (details should include at least start time and end time).
- Check if the object is **visible/detectable** in the next one day starting from the given epoch of tracker. If yes, print details for each visible event (details should include at least start time and end time).

Question 2

Given that you have to perform the analysis in question 1 for up to 30000 space objects and up to 100 trackers, how will you plan the program? Explain in detail the structure of program and strategies for making it computationally efficient. Use diagrams or flowcharts wherever necessary.

Notes

- List assumptions made, if any.
- Script for question 1 may be submitted in any digital format (code, github, hackerrank etc.) with clear instructions on how to access and run it.
- Upload answer to question 2 as a typed document in PDF format with a strict 2-page upper limit.

