The Technion – Israel Institute of Technology **Faculty of Aerospace Engineering**

Satellite Orbit Control 860290

Winter semester 2024/25

Assignment No 9

(Part a and c: Hand-in by 11/2/25
Do not hand-in Part b. Will be solved in class)

A communication satellite is placed in a geostationary orbit above longitude 30^0E. The longitude tolerance is $\pm 0.05^0$. The satellite is equipped with an on-off electric propulsion system with maximum thrust acceleration of 0.0001 m/sec^2. The thrusters are in the $\pm y$ direction.

a. Find the time between East-West corrections, and the altitude change between corrections.

b. Design a Sliding Mode Controller for the correction maneuver. Requirement: convergence (less than 2m) in less than 2 days. Make sure that the thrust is above the minimum gain.
Provide:

- Control law (gains and sliding surface).
- Plot of the D maneuver relative trajectory (drift + correction).
- Plot of thrust vs. time.
- x(t) and y(t) during the correction maneuver.
- The miss distance and the dV for the correction maneuver.

(Will be solved in class)

c. After some time of operation, the East-West correction thrusters failed, and the satellite started to drift due to the tesseral harmonics. You must issue an alert to all the GEO satellites that may be in danger. Find the longitude range of the satellites that may be in danger and plot the longitude vs. time for 3 years.