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

Satellite Orbit Control 0860290

Winter semester 2024-25

Assignment No 2

(Hand-in by 17/12/24)

Satellite #1 is orbiting the Earth in a circular orbit with a period of 100 minutes. Satellite #2 is in a circular orbit, with the same period as #1. The angle between the orbital planes is α=0.01 deg.

At t=0, the relative initial conditions of Sat#2 with respect to Sat#1, in CW frame (with origin at Sat#1), were:

$$x_2(0) = 0, \quad \dot{x}_2(0) = ??, \quad y_2(0) = -1km, \quad \dot{y}_2(0) = ??, \quad z_2(0) = 1km, \quad \dot{z}_2(0) < 0$$

It is desired to bring Sat #2 to a rendezvous with Sat#1 by applying velocity pulses. The thruster can apply pulses in the *y* and *z* directions only (no *x* direction).

a) Find the required maneuver time.
b) Find the initial and the terminal velocity pulses.
c) Provide x-y-z plot of the rendezvous trajectory.
d) Effect of measurement errors: Assume that the position measurement error is ±1m and the velocity measurement error is ±1cm/sec. Find the worst-case miss distance.