Astro Engr 423 – Homework 07

Name:

Due: Lesson 12

You may receive help from any person; however, you are required to turn in your own homework. This assignment must be documented in accordance with the policies explained in the DFAS Policy Letter and course handbook. Show all work – just writing the answer is not sufficient. If you use Matlab or some other software, provide a copy of your code. Submit your homework with this coversheet and per the homework format guidance in the course handbook.

Documentation:

Exercise 1 (20 pts)

Use the provided Matlab script (A423_HW7_student.m) and functions (YA.m, newton.m) to model relative motion near an elliptical reference orbit via the Yamanaka and Ankerson solution to the Tschauner Hempel Equations.

a) Choose an elliptical target orbit (a, e and $\nu(0)$) and an initial condition for the chase (relative position and velocity in the RIC frame). Code in these initial parameters and run the provided script to produce three plots of a relative motion trajectory about an elliptical reference orbit over two periods of the target's orbit.

b) Modify your initial condition from part (a) so that it satisfies the condition for periodic motion for the TH equations:

$$k(\nu(0))[\dot{y}(0) + \dot{\nu}(0)x(0)] + e\sin(\nu(0))[\dot{x}(0) - \dot{\nu}(0)y(0)] + \dot{\nu}(0)x(0) = 0$$

Code in this updated initial condition and run the provided script to produce three plots of a relative motion trajectory about an elliptical reference orbit over two periods of the target's orbit. Your trajectory should be periodic.

Hint: One way to proceed in (b) is to modify your initial $\dot{x}(0)$ *or* $\dot{y}(0)$ *from (a) such that the condition for periodic motion is met. Be sure to clearly show in hand-written calculations what your updated initial condition is and how you obtained it. However, do not round your initial state values before inputting into the script. Rather, just code your expression for* $\dot{x}(0)$ *or* $\dot{y}(0)$ *into the script.*