AOE 4134 Astromechanics Problem Sheet 10

Due 8 November, 2002

Read Chapters 1, 2.1-2.3, 2.5-2.6, 4.1, 4.2, 4.6, 8

45. Bate. Mueller, and White, Problem 2.8, page 145

46. Bate, Mueller, and White, Problem 2.10, page 146.

47. Write a code (MatLab preferred) that takes the (modified) classic orbital elements a, e, i, Ω, ω, and ν and returns:

a) The position and velocity vectors, $\vec{r}$, $\vec{V}$ in the Earth Centered Inertial (ECI) coordinate system.

b) The position and velocity vectors, $\vec{r}$, $\vec{V}$, in the Perifocal coordinate system.

c) Verify your code by applying it to problem 2.8 BMW (you have to calculate the semimajor axis from p and e so that you can enter the orbital elements a, e, i, Ω, ω, and ν)

48. Given the following orbital elements:

a = 0.7021, e = 0.82, τ = 1.5 TU and the current time t = 3.0 TU.

Find the true anomaly, ν, and the magnitude of the position vector, $|\vec{r}| = r$.

49. Write a code (MatLab preferred) the takes the orbital elements a, e, and τ, along with the current time, t, and determines the magnitude of r, and the true anomaly, ν. It should work for all types of orbits, elliptical, parabolic, and hyperbolic. Verify it (partially) by using the information from problem (48).

Now with the codes developed in problems 47 and 49, you could be given the classic orbital elements (a, e, i, Ω, ω, and τ), or the modified classical elements (a, e, i , Ω, ω, and ν) and determine the position and velocity vectors, ($\vec{r}$, and $\vec{V}$) in the ECI and perifocal coordinate systems.