Canonical Normalization Problems

Problem No. 01

Find the **orbital** parameters of a **satellite** injected at 1500 GMT on **July 23, 1991** with following **initial** conditions.

$$\vec{r} = \left(-5.1024\hat{i} + 3.8268\hat{j} + 3.1890\hat{k}\right) \times 10^6 m;$$

$$\vec{v} = -3162.0\hat{i} - 6324.0\hat{j} + 4743.0\hat{k} \quad (m/s)$$

Use Following Normalization in respect of Earth:

$$1DU = 6.378 \times 10^6 \text{ m}; \quad 1TU = \frac{P}{2\pi} = 806.8s;$$

$$1SU = 1DU/1TU = 7905m/s; \quad \mu = 1$$

Determine the corresponding orbital **parameters**.

Solution No. 01

The resulting **orbital parameters** are as follows.

$$\vec{r} = -0.8\hat{i} + 0.6\hat{j} + 0.5\hat{k};$$

$$\vec{v} = -0.4\hat{i} - 0.8\hat{j} + 0.6\hat{k}$$

$$r = 1.118DU; \quad v = 1.077SU;$$

$$\varepsilon = -0.31DU^2 / TU^2; \quad a = 1.61DU;$$

$$\vec{e} = -0.156\hat{i} + 0.271\hat{j} + 0.049\hat{k}; \quad e = 0.32$$

$$i = 42.6^\circ; \quad \vec{n} = -0.28\hat{i} + 0.76\hat{j};$$

$$\Omega = 110^\circ; \quad \omega = 10.3^\circ; \quad \theta = 26.8^\circ$$