Spacecraft Mission Design
Assignment #1 General Satellite Information and Simulation Exercise

1) General Satellite Questions.

a) Approximately how long does it take a Low Earth Orbit (LEO) satellite to complete one full revolution of the Earth?

b) What are one or more of the applications of the following satellites?

- ENVISAT
- HINODE (Solar-B)
- GIOVE-A
- QuickBird
- Hot Bird 10

c) What is the approximate altitude of a Geosynchronous Satellite?
d) What are Molniya and Tundra Orbits?
e) Will a GPS receiver work in Low Earth Orbit? Medium Earth Orbit? Geosynchronous Orbit?

Note: All of the above information is available on Wikipedia (or elsewhere on the Internet)

2) Programming Exercise

Implement the following in Octave or MATLAB or another language of your choice.

a) Real-Time Simulation

Write a program that simulates events occurring in real or accelerated time, including the following requirements:

- The simulation can be initialized to any start time in the format year, month, day, hour, minute, second, sub-second.
- Logs the simulated time to a file every 1 minute.
- Every 5 minutes a random number is generated and stored with a time stamp.
- Every 90 minutes, a checksum is calculated on the sequence of random numbers.
- Twice a day (at times read from a file) the sequence of random numbers is saved to a file.

In other words, we want to be able to run the program quickly where 1 minute of simulation time takes a fraction of a second to complete, as well as run the simulation time with 1 minute of simulation equals 1 minute of real time.

This programing will require you to become familiar with the following features of the programming language of your choice → reading the system time, file input/output, random number generation. As well as learning to manage the execution speed of the simulation and schedule time based events.

The solution will be presented in Octave.