Code No: 07A62106 **R07** **Set No. 4**

**III B.Tech II Semester Regular/Supplementary Examinations,May 2010**
**INTRODUCTION TO SPACE TECHNOLOGY**
**Aeronautical Engineering**

**Time: 3 hours** **Max Marks: 80**

**Answer any FIVE Questions**
**All Questions carry equal marks**

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1. Write a short note on the following:
   (a) Trajectory and deceleration of a re-entry vehicle
   (b) Trajectory and heating of a re-entry vehicle. [8+8]
2. Write a short note on:
   (a) Hohmann transfer
   (b) Bi - elliptical transfers
   (c) Combined maneuvers. [5+5+6]
3. (a) Differentiate between a 'spacecraft' and a 'launch vehicle'.
   (b) Write short notes on Trajectories and orbits. [8+8]
4. (a) Write the important features of a satellite in geostationary orbit.
   (b) The Virginia Tech earth station is located at $80.438^0$ longitude and $37.229^0$ N latitude. Calculate the look angles (azimuth and elevation angles) to a geosynchronous satellite whose sub-satellite point is located at $121^0$ W longitude.
   (c) Why do signal losses occur in the earth's atmosphere for satellite communication? Write a note on ionospheric effects. [6+6+4]
5. Explain briefly about the attitude control for spining space craft. [16]
6. What do you understand by 'parking orbit' and 'impulsive shot' with reference to interplanetary missions? Explain, how Hohmann trajectory is useful for interplanetary missions with less propellant consumption. [16]
7. While piloting a spacecraft you received a report of your position and velocity in the geo - centric equatorial frame as
   $\overline{R}$ = 7000 i + 0 j + 0 k km
   $\overline{V}$ = 0 i - 0.763 j + 0 k km/s
   (a) Sketch the spacecraft position vector and velocity vector relative to the Earth.
   (b) What is the specific angular momentum? Draw this vector on the sketch.
   (c) What does this angular momentum vector tell you about the orientation of your orbit ?

(d) What is the specific mechanical energy of the satellite?

(e) What is the shape of the trajectory? How can you tell? [16]

8. Describe the rocket motion in a homogeneous gravitational field for two cases of pitch angles; (a) $90^0$, and (b) less than $90^0$. [16]

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