Code No: 07A62106 **R07** **Set No. 3**

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. (a) What are the salient features of re-entry vehicles?
   (b) Write notes on the following:
      i. Space shuttle
      ii. Multi-staged rockets. [6+5+5]

2. What do you mean by attitude determination? What is the importance of attitude determination? [16]

3. Explain about the various communication satellite systems which are presently operational in space. [16]

4. (a) Describe the basic operating principles of a solid rocket motor. Give examples for their applications.
   (b) Explain how the shape of the propellant grain can affect the thrust profile of a solid rocket motor. [8+8]

5. The Hubble space telescope (HST) was placed in a circular orbit at an altitude of 600 km. Find the orbital characteristics to include the specific kinetic energy, the specific potential energy, the total specific energy, the period, the semilatus rectum p, the eccentricity, the orbital velocity, and the angular momentem H. [16]

6. (a) What are the forces that act on a re-entry vehicle? Among these which is the dominant force during re-entry? Elucidate.
   (b) A vehicle attempting to aero-brake into orbit around Mars needs to achieve an equivalent ΔV_{retro} of 2 km s^{-1}. If the entire aero-braking maneuver lasts for 10 minutes, estimate the drag force acting on the vehicle in the process, in terms of g's. [8+8]

7. (a) Write a note on Black body radiation curves. Explain how Stefan-Boltzman law can be useful in calculating the equilibrium temperature of a spacecraft without internal heat sources?
   (b) Write a short note about asteroids, comets and meteoroids. [10+6]

8. (a) A satellite is launched into Earth's orbit when its launch vehicle burns out at an altitude of 250 km. At this instant, the satellite's velocity is 7,900 m/s with ϕ (flight path angle, the angle between the local horizontal and the velocity vector) equal to two degrees. Calculate the satellite's altitude at perigee and at apogee.

(b) Calculate the eccentricity of the orbit for the satellite in the above problem. [10+6]

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