

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

1. (a) Explain the advantages and disadvantages of satellite communication systems.
(b) Explain why orbits and frequencies are said to be limited resources. [8+8]
2. With the help of a neat sketch, explain the basic principle of operation of an aerospace plane. Illustrate the major challenges or difficulties associated with the design of such an aerospace plane. [16]
3. (a) Explain briefly the characteristics of an Elliptical orbit.
(b) Determine the characteristics of an earth satellite with a perigee altitude of 5500 km and an apogee altitude of 20000 km. [6+10]
4. What are Galactic Cosmic rays? Describe the mechanism that protects the Earth from the effects of solar and cosmic charged particles. [16]
5. Write about the attitude control of a non-spinning spacecraft
 - i) using thrust and
 - ii) using momentum wheel. [8+8]
6. Mission planners for a manned spacecraft for Mars Mission have considered two different re-entry vehicles. Vehicle 'A' has a high Ballistic Coefficient while the other vehicle 'B' has a low Ballistic Coefficient. Assuming the re-entry velocity and flight path angle are the same for both the vehicles while entering the atmosphere of Mars, discuss the differences in the effects on the spacecraft, if any, in the light of the respective deceleration profiles. [16]
7. The position vector (\bar{R}) and velocity vector (\bar{V}) of a satellite are
 $R = 8228 \mathbf{i} + 389.0 \mathbf{j} + 6888 \mathbf{k}$ km
 $V = -0.7000 \mathbf{i} + 6.600 \mathbf{j} - 0.6000 \mathbf{k}$ km/s
 - (a) Determine the size and shape (semi-major axis and semi-minor axis) for this satellite
 - (b) Determine the inclination of the orbit. [16]
8. (a) How does a liquid propellant rocket differ from a solid propellant rocket? Explain which of the two will be useful for a sounding rocket of diameter 10 cm and length 1.5 m.
(b) A missile, a single stage rocket, carries a war head of 50 kg. It has a structural mass of 250 kg, and propellant mass of 2,700 kg. If the specific impulse is 300 seconds, calculate the burnout velocity. [8+8]

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Set No. 1
