

IV B.Tech I Semester Supplementary Examinations, April/May 2005
SPACE TECHNOLOGY
(Aeronautical Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Explain the principle of operation of a rocket motor. What are the assumption made in ideal rocket theory.
(b) Differentiate between solid propellant and liquid propellant rockets.
2. Consider a rocket engine burning hydrogen and oxygen. The combustion chamber pressure and temperature are 25 atm and 3517K respectively. The area of rocket nozzle throat is 0.1m^2 . The area of exit is designed so that the exit pressure exactly equals the ambient pressure at a standard altitude of 30 km. For the gas mixture, assume that $r = 1.22$ and the molecular weight $\bar{M} = 16$. At a standard altitude of 30 km. Calculate
 - (a) specific impulse
 - (b) thrust
 - (c) area of the exit and
 - (d) flow Mach number at exit.
3. (a) Derive the rocket equation which relates burnout velocity to the specific impulse and the initial to final mass ratio.
(b) Explain the desirable properties of liquid and solid propellant for rocket engines.
4. (a) Discuss the solar system briefly.
(b) Explain the various components of a multistage rocket. What will be the effect on mission velocity if an engine malfunctions and delivers a small percent less than the intended thrust.
5. (a) Explain Kepler's laws of planetary motion and how Newton modified these laws.
(b) What is ballistic factor? How does it affect the free flight dispersion?
(c) Why usually it is desired that the missile should be roll-stabilized?
6. (a) How does a flight envelope of a re-entry of ballistic missile differ from that of manned re-entry vehicle?
(b) Write short notes on the following:
 - i. Determination of orbital velocity
 - ii. Geo synchronous orbits.

7. (a) What are the various types of drags and how will you estimate them for a missile/rocket.
(b) Distinguish clearly between static and dynamic stability of a missile.
8. Write notes on any THREE of the following:
 - (a) Cryogenic engines
 - (b) Thrust misalignment
 - (c) Launching problem
 - (d) Jet Control methods
