R09

Code No: D7610

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech II - Semester Examinations, March/April 2011
ROCKET AND SPACECRAFT PROPULSION
(AEROSPACE ENGINEERING)

Time: 3hours **Max. Marks: 60**

Answer any five questions
All questions carry equal marks
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1. Answer the following:
   a) Derive the thermodynamic expression for effective exhaust velocity using isentropic flow relations.
   b) Write about the various types of orbits in space. Explain about elliptic transfer orbits and launch trajectories. Write the expressions for circular orbit velocity and escape velocity. [6+6]

2. Explain in detail the ignition process involved in a solid rocket motor. Mention the phases of ignition. [12]

3. Describe the various propellant feed systems in a liquid rocket engine. List at least five typical features of a propellant feed system. [12]

4. Explain the basic working principle of a hybrid propellant rocket engine. Describe the propellants used, the ignition process and the combustion process in a hybrid rocket. [12]

5. What is the principle of electric propulsion? Describe the working of an ion propulsion engine. What is space charge limit? Explain about the deceleration grid. [12]

6. Explain the working of (a) Radiofrequency and (b) FEEP thrusters. [12]

7. Write about the principle of the nuclear fission process. Discuss the following aspects of a nuclear thermal rocket: [12]
   a) Increasing the operating temperature.
   b) The control drums.
   c) Nozzle and thrust generation.

8. What are solar sails? Explain the working of a solar sail. Discuss about dielectric solar sails and their production sequence. [12]

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