R09

Code: 9A21709

B.Tech IV Year I Semester (R09) Supplementary Examinations, May 2013

ROCKETS AND MISSILES

(Aeronautical Engineering)

Time: 3 hours Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

****

1. (a) Describe the different types of grains used in a solid propellant motor of a rocket.
   (b) Explain the process of thrust generation in a solid motor.

2. (a) Describe the different types of injectors used in a liquid engine. Draw neat sketches.
   (b) Describe the nozzles of a liquid engine for (i) low altitude flight and (ii) very high altitude flight.

3. (a) What are the aerodynamic forces and moments acting on a missile and what are the sources of these forces and moments?
   (b) Describe with the help of neat sketches the different types of nose designs for a rocket and explain the relative advantages and disadvantages.

4. (a) Derive an expression for the burn-out velocity of a single stage rocket in free space.
   (b) What is the altitude achieved by a single stage rocket in vertical flight in a homogeneous gravity field, assuming no loss due to drag?

5. Derive an expression for the burn-out altitude of a two stage rocket in vertical flight. State the assumptions clearly.

6. Describe the different methods of thrust vector control in a rocket.

7. (a) What is tandem staging?
   (b) Derive the equations of a motion describing the relative motion of the separated stages of a tandem staged two stage rocket.

8. What are the sources of heat for a rocket? What are the materials used for the parts of the rocket subjected to thermal loads? Explain citing the compositions and properties of the materials.

******