

Code No: 07A72111

R07**Set No. 2**

IV B.Tech I Semester Examinations, NOVEMBER 2010
ROCKETS AND MISSILES
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

1. Differentiate between gas pressure feeding systems used on liquid propellant rockets mention their constructional details and relative performance. [16]
2. (a) How the burning rate of solid propellant can be increased ?
(b) Derive equations involving burning rate and gas velocity. [8+8]
3. (a) Derive equations of velocity and altitudes for the case of constant thrust.
(b) Find equations of velocity in terms of time after burnout time in the two dimensional motion of a rocket. [8+8]
4. What is the need of multi - stage rockets and explain about piggy type multi - staging ? [16]
5. What are the design considerations to be made for the lateral control in cruciform type of missile ? [16]
6. Discuss the need of tungsten, titanium and molybdenum metals and their alloys for the components of rockets and missiles. Mention their properties and applications. [16]
7. Describe the principle and working of side injection thrust vector control. How will this affect the performance of the rocket control ? [16]
8. (a) Describe various forces acting on the missile in the air and in vacuum.
(b) Calculate the turn radius and change in the flight path angle for pull - up maneuver of a missile. [8+8]

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R07**Set No. 4**

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ROCKETS AND MISSILES
Aeronautical Engineering

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

Answer any FIVE Questions
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1. (a) How the rockets and missiles are classified ?
(b) Describe the aerodynamic forces, lateral damping forces and dispersion of rockets. [6+10]
2. What are the various factors to be considered in the design of number of stages of a rocket and explain about direct staging ? [16]
3. (a) Explain about homogeneous gravitational field in atmosphere and in vacuum.
(b) Derive an equation for the culmination altitude of a two - stage rocket in vertical flight in a homogeneous gravitation field and in vacuum. [8+8]
4. What are the various components of the rockets and missiles made by MMC (Metal matrix Composites) and FRP (Fiber Reinforced Plastics), and mention their relative merits ? [16]
5. (a) Explain with a neat sketch the working principle of a solid propellant rocket motor.
(b) How the "combustion instability" affects the burning rate of solid propellant rocket motor ? [8+8]
6. How thrust termination method of control is used in solid and liquid propellant rockets. What are the problems associated with these methods? [16]
7. What are the various types of trajectories followed by the missile and explain the methods to calculate the Boost - Sustain trajectory ? [16]
8. Explain with a neat sketch the construction and working of combustion chamber and indicate various elements of the chamber used in liquid propellant rocket. [16]

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R07**Set No. 1**

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Aeronautical Engineering

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

Answer any FIVE Questions
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1. Differentiate between the sequence of operations involved and dynamics in the separation of tandem and parallel stages. [16]
2. (a) Describe various features of long range missile trajectory and derive equations for their relations.
(b) Why roll stabilization is difficult in a missile having canard control? [8+8]
3. What are the different types of igniters used in practice and explain the characteristics of igniter propellants ? [16]
4. Sketch and explain the gas pressure feeding system used on liquid propellant rocket engine and mention its advantages. [16]
5. Derive equations for the ideal turn-out velocity for the maximum ideal velocity of a two - stage rocket. [16]
6. (a) Compare the motion of rockets in free space and gravitational fields.
(b) Derive equation for motion of the static longitudinal stability of rocket having a translational and rotational motion. [8+8]
7. Specify various components of the rockets and missiles using metals, non - metals and alloys mentioning their properties and applications. [16]
8. What are the various factors to be considered in the selection of thrust vector control method in the solid and liquid propellant rockets. Compare the method of implementation of this control on the above two types of rockets? [16]

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R07**Set No. 3**

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ROCKETS AND MISSILES
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Derive the TSIOLKOFKY'S equation for the velocity of a rocket.
(b) What is induced drag and how does it depend on aspect ratio? [8+8]
2. What are the properties to be considered in the selection of materials for rocket nozzles? [16]
3. What is the need of multi - stage rocket system and derive equations to find the velocity at the end of burn out of the rocket and maximum altitude obtained ? [16]
4. Sketch and explain different parts of a liquid propellant rocket motor and mention the materials used for these components. [16]
5. (a) Discuss the effect of Jet vane controlled thrust vector of liquid propellant rocket.
(b) What is the need of using auxiliary thrust - chamber in the liquid - propellant rockets ? [8+8]
6. (a) What is the necessity of gravity turn trajectory and how can it be obtained ?
(b) Derive equations for translation motion of a rocket in homogenous gravitational field. [8+8]
7. (a) Describe various features of long range cruise trajectory and their relation.
(b) Why ramjet powered missiles prefer wing control ? [8+8]
8. (a) What is the need of igniter in a solid propellant motor ?
(b) What are the effects of igniter on the performance of a solid propellant motor ? [8+8]
