**R07** 

Set No. 2

## IV B.Tech I Semester Examinations, MAY 2011 ROCKETS AND MISSILES Aeronautical Engineering

Time: 3 hours

Code No: 07A72111

Max Marks: 80

### Answer any FIVE Questions All Questions carry equal marks \*\*\*\*\*

- 1. Discuss about different ignition systems used in liquid propellant rocket. [16]
- 2. What is the need of thrust termination ?Explain different methods of thrust termination in solid propellant rocket motors ? [16]
- 3. (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]
- 4. (a) Derive an equation for the stability derivatives of a missile with rear control.
  - (b) How the wing, body and tail influence in the directional stability and control of missile ? [8+8]
- 5. What materials are to be selected for compressor blades and mention the alloying elements, properties and capabilities ? [16]
- 6. (a) How the combustion instability affects the burning rate of a solid propellant in the rocket motor ?
  - (b) How the ignition process will be carried out in a solid propellant rocket motor? [8+8]
- 7. (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]
- 8. Derive an expression for 2 stage rocket and a vertical ascent for culmination altitude and also show that it decreases with increase in coast time between burn out of stage 1 and ignition of stage 2. [16]

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**R07** 

## Set No. 4

## IV B.Tech I Semester Examinations, MAY 2011 ROCKETS AND MISSILES Aeronautical Engineering

Time: 3 hours

Code No: 07A72111

Max Marks: 80

### Answer any FIVE Questions All Questions carry equal marks \*\*\*\*\*

- 1. (a) How the magnitude of the thrust is controlled in solid propellant rockets ?
  - (b) How the throat area of the nozzle is varied and mention the effects of varying the throat area ? [8+8]
- 2. (a) Explain various modes which represent the response characteristics of missile, when disturbed from the equilibrium.
  - (b) Derive equations of motion of a rocket in a fixed axes system. [8+8]
- 3. (a) Derive the equation for altitude at the end of powered flight for a rocket with vertical flight in frictional air.
  - (b) Find out equations for the maximum distance covered by the rocket in the vertical direction. [8+8]
- 4. What are the specific mechanical and metallurgical properties possessed by nickel alloys? What components of rockets and missiles are made by these alloys? [16]
- 5. Sketch and explain the gas pressure feeding system used on liquid propellant rocket engine and mention its advantages. [16]
- 6. With the aid of neat sketch explain the axes system used to describe the dynamics of separation. Describe all the symbols used. [16]
- 7. (a) What is the need of raked tips and explain their advantages in the missiles ?
  - (b) Derive an expression for the base pressure and explain its variation with Mach number. [8+8]
- 8. (a) What are the advantages and influence of oxidizers and binders on the solid propellant rockets ?
  - (b) Describe the process of combustion in solid propellant rocket motor. [8+8]

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**R07** 

# Set No. 1

## IV B.Tech I Semester Examinations, MAY 2011 ROCKETS AND MISSILES Aeronautical Engineering

Time: 3 hours

Code No: 07A72111

Max Marks: 80

### Answer any FIVE Questions All Questions carry equal marks \*\*\*\*

- 1. Define the terms Culmination point, Culmination altitude. Derive the expressions for the coordinates of Culmination point for rocket motion with constant pitch angle in homogeneous gravitational field. [16]
- 2. What materials are chosen for the structures exposed to high temperatures of rockets and missiles and mention their properties ? [16]
- 3. (a) Explain about mass ratio, payload ratio, propellant ratio and structural efficiency of multi stage rocket system.
  - (b) Explain various methods of staging for a multi stage rocket. [8+8]
- 4. (a) Describe various features of long range cruise trajectory and their relation.
  - (b) Why ramjet powered missiles prefer wing control ? [8+8]
- 5. (a) What are the various factors to be considered in deciding the amount of charge in an igniter?
  - (b) What problems will be developed, if correct quantity of charge is not used in the igniter ? [8+8]
- 6. (a) Explain with a schematic diagram the distribution system of liquid propellant.
  - (b) Draw the schematic arrangement of impinging jet for like propellants and unlike propellants. [8+8]
- 7. Explain with neat sketches attitude control of solid and liquid propellant rockets. Mention the problems encountered in each of them. [16]
- 8. Describe about culmination of a rocket and derive expressions for the total time of culmination of rocket with multi stages. [16]

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**R07** 

Set No. 3

## IV B.Tech I Semester Examinations, MAY 2011 ROCKETS AND MISSILES Aeronautical Engineering

Time: 3 hours

Code No: 07A72111

Max Marks: 80

#### Answer any FIVE Questions All Questions carry equal marks \*\*\*\*\*

- 1. (a) What are the different types of ceramic and refractory materials used in rockets. Explain their properties and applications ?
  - (b) Describe the properties and application of graphite materials and carbon carbon composites. [8+8]
- 2. (a) What is the need of multi stages in a rocket and explain about payload mass, propellant mass, and structural mass ?
  - (b) Describe advantages of parallel staging over tandem staging in a multi stage rocket system. [8+8]
- 3. Describe about "safe separation" of multi stage rocket. [16]
- 4. (a) Derive an expression for the static margin of a missile with rear control as well as the forward control.
  - (b) Explain with a neat sketch the missile with tail control and nose flap control and mention their characteristics. [8+8]
- 5. 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]
- 6. Sketch and explain turbo pump feeding system used on liquid propellant rockets and mention their constructional details and relative performance. [16]
- 7. Sketch and explain pyrogen ignition system and mention its advantages over other systems. [16]
- 8. (a) Compare the motion of rockets in free space and gravitational fields.
  - (b) Derive equation of motion for the static longitudinal stability of rocket having a translational and rotational motion. [8+8]

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