

# CBCS SCHEME

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18AE/AS653

**Sixth Semester B.E. Degree Examination, June/July 2023**

## **Basic of Rockets and Missiles**

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### **Module-1**

- 1 a. Classify the types of launch vehicles with example. (10 Marks)  
b. Describe the layout of missile with diagram and explain its components. (10 Marks)

**OR**

- 2 a. Discuss about performance parameters used in rocket design with necessary equation. (10 Marks)  
b. Consider a rocket engine is tested in ideal condition. It provides the following data :  
Exhaust velocity = 2000m/s. Nozzle area =  $2.5\text{m}^2$ , Mass flow rate = 200kg/s. Assume  $g = 9.81\text{m/s}^2$ . Calculate the specific impulse of propellant and the thrust procured by the engine. (10 Marks)

### **Module-2**

- 3 a. Explain the types of ignition system used in solid rocket motor. (10 Marks)  
b. Discuss about various grain configurations used in solid propellants. (10 Marks)

**OR**

- 4 a. Explain the types of cooling techniques used in thrust chamber. (10 Marks)  
b. Discuss about types of injectors used in liquid propellant rockets. (10 Marks)

### **Module-3**

- 5 a. Describe the forces and moments acting on the rocket projectile with neat sketch and obtain the relation. (10 Marks)  
b. Obtain the expression for lateral and longitudinal aerodynamic moment for a missile. (10 Marks)

**OR**

- 6 a. Classify missiles based on various parameters and explain with example. (10 Marks)  
b. Discuss the types of drag acting on a missile and explain. (10 Marks)

### **Module-4**

- 7 a. Obtain expression for Tsiolkovsky's equation from equation of motion. (10 Marks)  
b. Define gravity turn trajectories and obtain equation for gravity turn trajectory. (10 Marks)

**OR**

- 8 a. Discuss about methods of thrust vector control and the mechanism used for TVC. (10 Marks)  
b. Explain the thrust termination and its methods. (10 Marks)

### **Module-5**

- 9 a. Discuss about various types of tests performed on the rockets and explain. (10 Marks)  
b. Discuss the post-accident procedures to be followed during rocket testing. (10 Marks)

**OR**

- 10 a. Explain the criteria for selection of various materials for rockets and missiles. (10 Marks)  
b. Discuss about the requirements of materials for thermal protection and pressure vessel. (10 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and/or equations written eg,  $42+8=50$ , will be treated as malpractice.