Hall Ticket No | | | | | | | | | | | Question Paper Code: AAEC27

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech VI SEMESTER END EXAMINATIONS (REGULAR) - JULY 2023
Regulation: UG-20
ROCKET AND MISSILE TECHNOLOGY
(AERONAUTICAL ENGINEERING)

Time: 3 Hours **Max Marks: 70**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) Illustrate briefly four major subsystems of rocket and explain three main key parameters for rocket engine design. [BL: Understand| CO: 1|Marks: 7]

   (b) A spacecraft has an initial mass of 30,000 kg whose engine ejects mass at a rate of 30 kg/s with an exhaust velocity of 3,100 m/s. The pressure at the nozzle exit is 5 kPa and the exit area is 0.7 m^2.

   i) Find the thrust of the engine in a vacuum

   ii) Determine the change in velocity, if the spacecraft burns its engine for one minute

   [BL: Apply| CO: 1|Marks: 7]

MODULE – II

2. (a) Summarize the different types of nozzle used in rocket engines based on its shapes. [BL: Understand| CO: 2|Marks: 7]

   (b) Illustrate the influence of solid rocket grain design on the combustion of the engine. [BL: Understand| CO: 2|Marks: 7]

MODULE – III

3. (a) With a neat sketch explain the liquid rocket propulsion system and label the parts. List the advantages of liquid propellant over a solid propellant rocket engine. [BL: Understand| CO: 3|Marks: 7]

   (b) Examine the difference in functionality of pressure fed cycle, full staged combustion cycle and gas generator cycle of liquid rocket engine. [BL: Understand| CO: 3|Marks: 7]

4. (a) List the methods of cooling employed in rockets. Illustrate the factors affecting the liquid rocket injector behavior. [BL: Understand| CO: 4|Marks: 7]

   (b) Explain the combustion instabilities in liquid propellant rockets and the corrective measure to minimize the effect. [BL: Understand| CO: 4|Marks: 7]

MODULE – IV

5. (a) How does the design of a missile's fins or control surfaces impact its stability and maneuverability during flight? [BL: Understand| CO: 5|Marks: 7]

(b) Outline the concept of guidance control in missiles and discuss the methods or technologies commonly employed during this phase. [BL: Understand| CO: 5|Marks: 7]

6. (a) Mention different forms of missile controls.Discuss the timeline and advancements happening in Indian missile program. [BL: Understand| CO: 5|Marks: 7]

(b) Write a brief description on the types, components and application of guided missile system. [BL: Understand| CO: 4|Marks: 7]

MODULE – V

7. (a) Describe in detail about test facility of chemical rocket propulsion system with neat sketch. [BL: Understand| CO: 6|Marks: 7]

(b) List the properties to be considered while selecting materials for different parts of a rocket. Demonstrate the different types of testing and evaluation of design for missiles. [BL: Understand| CO: 6|Marks: 7]

8. (a) Write short notes on ablatives. Explain the impact of space environment on materials used in satellite and ICBM. [BL: Understand| CO: 6|Marks: 7]

(b) Elucidate instrumentation and data management systems for rocket testing. How the trajectory is monitored? [BL: Understand| CO: 6|Marks: 7]

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