

CBCS SCHEME

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18AE/AS653

Sixth Semester B.E. Degree Examination, July/August 2022 Basics 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. Explain the nuclear rocket engine with help of a neat diagram and also mention its advantages and disadvantages. (10 Marks)
- b. List and explain the criteria used in the selection of a particular rocket propulsion system. (10 Marks)

OR

- 2 a. Define multistage rocket. Explain with a neat sketch types of multistage rockets. Also mention the advantages and disadvantages of staging. (10 Marks)
- b. With a neat sketch, explain the solar thermal rocket system. (05 Marks)
- c. Explain the mission profile of strategic missile. (05 Marks)

Module-2

- 3 a. Explain the principle of solid propellant rocket motor with help of a neat labeled diagram and also mention its advantages and disadvantages. (10 Marks)
- b. With a neat sketch, explain the fixed nozzle and movable nozzle. (06 Marks)
- c. List out the solid propellant characteristics. (04 Marks)

OR

- 4 a. List and explain the liquid fuels used for the Rocket engine. (10 Marks)
- b. Explain with the help of a neat diagram, pressure-fed bi-propellant rocket engine. (06 Marks)
- c. Explain the desirable physical properties of liquid propellants. (04 Marks)

Module-3

- 5 a. Define Missile. Explain the broad classification of Missiles. (10 Marks)
- b. Derive the equation for describing the Aerodynamic forces and moments. (10 Marks)

OR

- 6 a. Write a note on the following:
 - (i) Lateral aerodynamic moment of the rocket. (05 Marks)
 - (ii) Longitudinal moment of the rocket. (05 Marks)
- b. Explain the following:
 - (i) Rocket dispersion. (06 Marks)
 - (ii) Drag Estimation. (04 Marks)

Module-4

- 7 a. Derive Tsiolkovsky's Rocket equation. (10 Marks)
- b. Derive the equation for vehicle velocity and Range for the vertical motion in the Earth's gravitational field. (10 Marks)

OR

- 8 a. Explain the following : (i) Thrust magnetic control (05 Marks)
(ii) TVC Integration with vehicle (05 Marks)
b. Write a short note on : (i) Stage separation dynamics (04 Marks)
(ii) Motion in the atmosphere (06 Marks)

Module-5

- 9 a. List down the Rocket test facilities and safeguards and explain with the help of sketch, vertical static test stand for a large liquid propellant thrust chamber. (10 Marks)
b. Explain the different types of rocket tests. List and explain the programs for which these tests are performed. (10 Marks)

OR

- 10 a. Write a short note on following:
(i) Flight testing. (04 Marks)
(ii) Instrumentation and Data management. (04 Marks)
(iii) Cryogenic temperature (02 Marks)
b. Explain the following :
(i) Requirements for choice of materials for liners and inhibitors. (06 Marks)
(ii) Post-Accident procedures. (04 Marks)

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