



CBCS SCHEME

17AE564

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020 Basics of Rockets and Missiles

Time: 3 hrs.

Max. Marks: 100

- Note:** 1. Answer FIVE full questions, choosing ONE full question from each module.
2. Assume missing data suitably.

Module-1

- 1 a. Define a rocket and guided missile. Describe the similarities and differences between them. (08 Marks)
b. Describe the different types of Launch vehicles. (06 Marks)
c. Illustrate the working principle of Rocket. (06 Marks)

OR

- 2 a. Explain the following:
(i) Staging and its significance with respect to Rockets.
(ii) Payload and its types. (06 Marks)
b. A Rocket projectile has the following characteristics:
Initial mass = 200 kg
Mass after rocket operation = 130 kg
Payload, non-propulsive structure etc = 110 kg
Rocket operating duration = 3 seconds
Specific impulse of propellant = 240 s.
Determine the vehicles mass ratio, propellant mass fraction, propellant flow rate, thrust, total impulse mass ratio of rocket system, acceleration of vehicle. (12 Marks)
c. List the different launch vehicles of Indian space program. (02 Marks)

Module-2

- 3 a. Define propellant grain. Explain different methods of installing/preparing the grain. (06 Marks)
b. Describe the characteristics of solid propellant. (08 Marks)
c. Classify and explain different types of nozzles used in solid propellant rocket motors. (06 Marks)

OR

- 4 a. Explain the gas pressure feed system of liquid propellant rocket engines. (08 Marks)
b. Illustrate the various arrangements of propellant tanks in rocket engines. (06 Marks)
c. List out the steps to be followed during the start and stop of liquid propellant engines. (06 Marks)

Module-3

- 5 a. Classify Missiles based on different modes. Explain each classification. (10 Marks)
b. Describe the airframe components of Tactical Missile with a neat sketch. (10 Marks)

OR

- 6 a. Illustrate different types of Aerodynamic forces acting on a missile while passing through the atmosphere. (08 Marks)
b. Define Rocket Dispersion. Explain different sources and methods of estimating the rocket dispersion. (08 Marks)
c. Write a short note on body upwash and downwash with respect to missiles. (04 Marks)

Module-4

- 7 a. Derive the Tsiolkovsky's Rocket equation for,
(i) Ideal case (ideal condition) (16 Marks)
(ii) Vertical motion case. (04 Marks)
Also, obtain the expression of Range for both cases.
- b. Write a short note on Gravity turn.

OR

- 8 a. Describe the various methods of Thrust Vector control with the help of neat diagram. (10 Marks)
- b. Explain the following : (10 Marks)
(i) Thrust magnitude control.
(ii) Thrust Termination and its methods.

Module-5

- 9 a. List out the different types of Tests performed on Rockets. Explain. (08 Marks)
b. Describe the major systems (or) components of test facilities. (06 Marks)
c. List out the procedures to be followed in case of major failure during the Rocket test. (06 Marks)

OR

- 10 a. Mention the criteria for selection of materials for the construction of Rockets (or) Missiles. (10 Marks)
b. Describe the requirements for choice of materials for liners, insulators and inhibitors. (10 Marks)
