

Hall Ticket No

Question Paper Code: AAE518



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## MODEL QUESTION PAPER

B.Tech VIII Semester End Examinations, May- 2020

Regulations: R16

**ROCKET AND MISSILES**

(AERONAUTICAL ENGINEERING)

**Time: 3 hours**

**Max. Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

### MODULE- I

1. a) Give a brief note on performance characteristics of rockets. [7M]
- b) Explain the methods used to theoretically estimate the drag coefficients of a rocket? [7M]
2. a) A Rocket Engine has an Isp of 363 sec and can produce a thrust of 2MN. Calculate the equivalent velocity  $\dot{m}$  of the engine. Determine the mass ratio required to reach a change in velocity of 7700m/s. [7M]
- b) Derive the Tsiolkovsky's rocket equation for the rocket motion in free space. [7M]

### MODULE - II

3. a) Explain the burning rate relation with pressure and temperature. [7M]
- b) What are different types of igniters in solid rocket motor and explain briefly any one of them? [7M]
4. a) Explain with a neat sketch, thrust vector control of a solid propellant motor using a flexible nozzle. Mention clearly which part of the nozzle is flexible. [7M]
- b) Explain briefly different failure modes in Solid Rocket motor? [7M]

### MODULE – III

5. a) Elucidate briefly advantages and disadvantages of liquid propellant systems? [7M]
- b) Write short note on [7M]
1. Stage combustion cycle
  2. Turbo pump feed system.
6. a) Explain film cooling and transpiration cooling applied to rocket engine nozzles and turbine blades [7M]
- b) Which system (pressure or turbo fed) do you recommend for a large booster of a rocket and why? [7M]

### MODULE – IV

7. a) What is a navigational guidance system? Explain about different types of navigational guidance systems? [7M]
- b) Describe briefly Homing guidance system and its types? [7M]
8. a) Explain in detail about different stages of launch vehicle that uses two or more rocket stages. [7M]
- b) Are the systems for the separation of parallel stages and tandem stages similar or different? Explain. [7M]

### MODULE – V

9. a) Classify the composite materials and write their uses for different temperature zone. [7M]
- b) Explain how you would select materials for different parts of a nozzle of a solid or liquid rocket. What are the materials that are used? [7M]
10. a) What are the properties to be considered while selecting materials for different parts of a rocket? Explain in detail. [7M]
- b) Write short notes on [7M]
1. Ablatives
  2. Managing steels
  3. Cryogenic temperatures and material requirement.