R09

Code No: 58095

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year II Semester Examinations, May - 2019
LAUNCH VEHICLE AND MISSILE TECHNOLOGY
(Aeronautical Engineering)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) Define mission profile. [2]
b) Define propulsive efficiency and overall efficiency of a jet engine along with its mathematical equation. [3]
c) Briefly discuss the types of grain configuration. [2]
d) What are the various types of nozzles based and their configuration? [3]
e) List out various airframe components of a rocket [2]
f) Briefly discuss the types of missiles based on their guidance system. [3]
g) What is orbital injection? [2]
h) Define culmination altitude and its significance for a missile. [3]
i) What is lapse rate and list out the factors affecting it. [2]
j) What are the parameters observed during the flight testing of rockets? [3]

PART - B

(50 Marks)

2.a) Describe the key parameters affecting the performance of a launch vehicle.
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; The rocket operates for a duration of 3 seconds. Determine the values of (i) Mass ratio (ii) Propellant mass fraction (iii) Propellant mass flow rate. [10]

OR

3. What are the different materials used in rockets? What are their special requirements? [10]

4. Name and explain different types of propellants used in solid rockets. [10]

OR

5.a) List out the steps to be followed to increase the burning rate of propellant.
b) Describe the different types of grains of a solid propellant. [10]

6. Why a re-entry body develops high temperatures on its skin during re-entry? Suggest suitable remedies to overcome it. [10]

OR

7.a) Suggest few remedies to reduce rocket dispersion.

b) Calculate the skin friction coefficient of the fin of the chord 1 m of a rocket flying at 200 m/s speed. The density of air is 0.9 kg/m^3 and coefficient of viscosity is 0.00002 Kg/(m) (s). Assume fully turbulent flow over the fin. [10]

8. Derive an expression for culmination altitude of a rocket in gravity turn. Make suitable assumptions for expression of thrust. [10]

OR

9. List the thrust vector control methods commonly employed in rocketry and explain any one of them. [10]

10. Explain about post accident procedure in rocket testing. [10]

OR

11. Describe the launch sequence of a typical space launch vehicle. [10]

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