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D – 3460

Reg. No. :

Name :

Eighth Semester B.Tech. Degree Examination, December 2017
08.806.1 : PROPULSION ENGINEERING (MPU)
(2008 Scheme)

Time : 3 Hours

Max. Marks : 100

Instructions : Answer **all** questions from Part – A and **one full** question from **each** Module of Part – B. **Use of Gas tables permitted.**

PART – A

1. Discuss the limitations in the design of gas turbine.
2. Define thrust and thrust power in rocket and turbojet engine.
3. Discuss the principle of scram jet engine and list out any four advantages of scram jet engine.
4. What is plasma rocket propulsion ?
5. Brief solar rocket working principle.
6. Write short note on thrust argumentation method.
7. What are the design parameters used to design a rocket compressor ?
8. Define hypergolic fuel. Give some examples.
9. Define thrust vectoring and draw sketch.
10. Briefly explain nuclear rocket working principle. **(10×4=40 Marks)**

P.T.O.



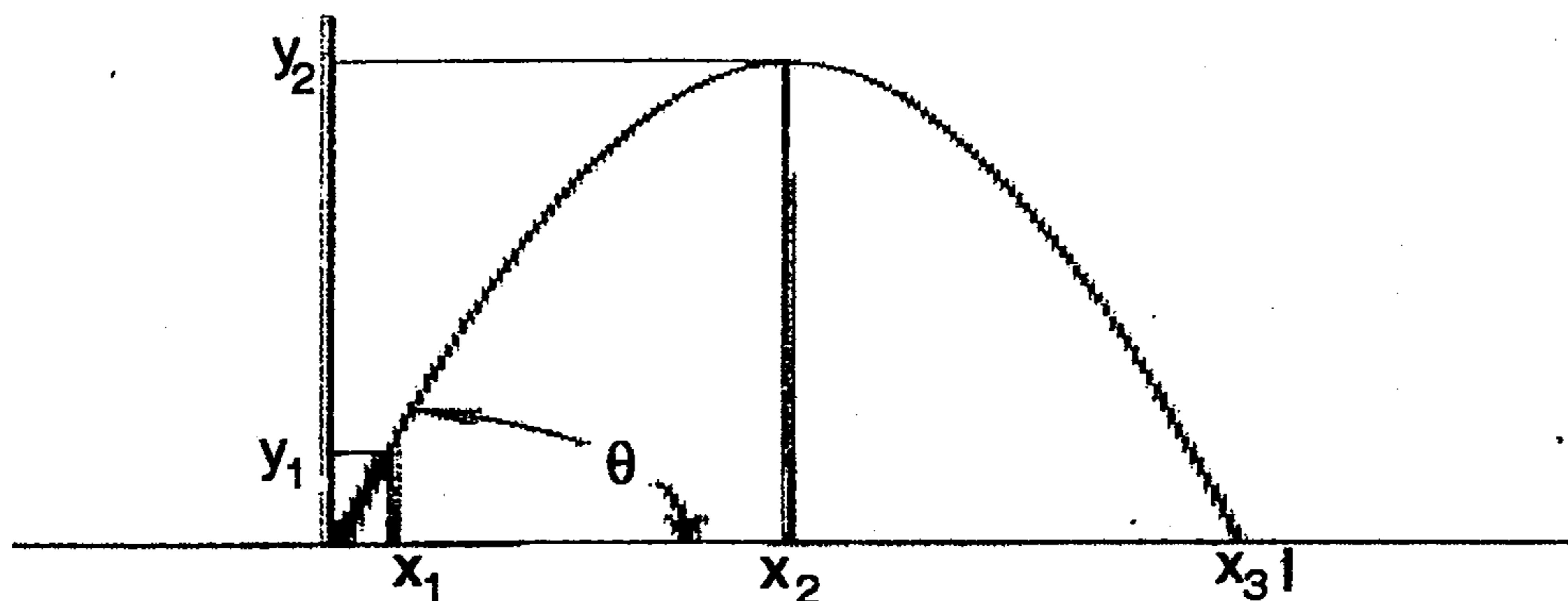
PART – B

Module – I

11. Derive efficiency and impulse equation by thermodynamic analysis for turbojet engine and also state the assumptions. 20

OR

12. A simple single-stage rocket for a rescue flare has the following characteristics and its flight path nomenclature is shown in the sketch.



Launch weight 4.0 N, Useful propellant mass 0.4 kg, effective specific impulse 120 sec, Launch angle (relative to horizontal) 80° , Burn time (with constant thrust) 1.0 Sec. Drag is to be neglected. Assume no wind. Assume the local acceleration of gravity to be equal to the sea level g_0 and invariant throughout the flight. Solve for the initial and final acceleration of powered flight, the maximum trajectory height, the time to reach maximum height, the range or distance to impact and the angle at propulsion cut-off and at impact. 20

Module – II

13. A certain nozzle expands a gas under isentropic conditions. Its chamber or nozzle entry velocity equals 70 m/sec, its final velocity 1500 m/sec. What is the change in enthalpy of the gas? What percentage of error is introduced if the initial velocity is neglected? 20

OR

14. With an aid of neat sketch explain the turbopump construction and working. 20



Module – III

15. A rocket projectile has the following characteristics : Initial mass 200 kg, Mass after rocket operation 130 kg, Payload, nonpropulsive structure, etc. 110 kg, Rocket operating duration 3.0 sec, Average specific impulse of propellant 240 sec, Determine the vehicle's mass ratio, propellant mass fraction, propellant flow rate, thrust, thrust-to-weight ratio, acceleration of vehicle, effective exhaust velocity, total impulse and the impulse-to-weight ratio. **20**

OR

16. i) Compare and contrast the properties of different rocket fuels. **10**
ii) Explain the working principle of igniters used in rocket propulsion. **10**

(3×20=60 Marks)
