Code.No: 37168 | R05 | SET-4

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
IV.B.TECH - I SEMESTER REGULAR EXAMINATIONS NOV/DEC, 2009
ROCKETS AND MISSILES
(AERONAUTICAL ENGINEERING)

Time: 3hours **Max.Marks:80**

Answer any FIVE questions
All questions carry equal marks

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1.a] Describe the combustion process in a solid propellant motor.
b] Explain the factors influencing burn-rate of a propellant. [10+6]

2. Sketch and explain turbo-pump feed system of liquid propellant rockets. Mention the construction details and flow line of propellants. [16]

3. Write short notes on
a] Up wash and down wash
b] Drag estimation
c] Damping moment coefficients
d] Atmospheric affects on rocket motion. [4+4+4+4]

4.a] Explain qualitatively vertical flight, constant pitch angle flight and gravity turn flight of rockets. Among these three, which is the more practical flight and why?
b] Derive the equation for the burn-out range (horizontal distance covered by the rocket by the time of burn-out) in uniform gravitational field for the case of constant thrust and gravity turn. [8+8]

5.a] Explain mass ratio, pay load ratio, propellant ratio and structural efficiency of a multi – stage rocket system and of individual stages.
b] Derive the expression for the burn-out velocity of a multi stage rocket of ‘n’ stages in vertical flight in homogeneous gravity field in vacuum.
c] How is the burn-out velocity referred to in section ‘b’ affected if the flight is in atmosphere? Explain. [6+8+2]

6. Explain the various methods of thrust vector control used in solid and liquid propellant rockets. [16]

7. Formulate the equations of dynamics of separation of tandem type of a two stage rocket. Explain clearly the type of separation system assumed. [16]

8. What are the materials that can be used for combustion chambers to withstand high pressures and temperatures? [16]

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