

Code No: 58095

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**B. Tech IV Year II Semester Examinations, June - 2018****LAUNCH VEHICLE AND MISSILE TECHNOLOGY****(Aeronautical Engineering)****Time: 3 Hours****Max. Marks: 75****Answer any Five Questions
All Questions Carry Equal Marks**

- 1.a) What are the similarities and differences between a typical missile and a typical satellite launch vehicle?
b) Describe in detail the Polar Satellite Launch Vehicle of India.
c) Distinguish between control and guidance of a rocket. Why are they necessary for a rocket? Explain in detail. [5+5+5]
2. Explain the following with respect to solid rocket motors.
a) Erosive burning
b) Chuffing
c) Grain configuration
d) Compositions of propellants. [4+3+4+4]
- 3.a) Describe the main engine of the Space Shuttle of USA.
b) Describe the different types of injectors.
c) Describe the typical thrust profile of a liquid engine. [5+5+5]
- 4.a) What are the effects of atmosphere on the performance of a rocket.
b) Describe the damping moments acting on a rocket in atmospheric flight.
c) How do lift and drag get generated on a rocket in flight? [5+5+5]
- 5.a) Define specific thrust and gravity turn. Derive an equation stating the relationship between flight time and flight path angle for the gravity turn trajectory of a rocket with constant specific thrust.
b) A single stage rocket jet exhaust velocity is 3050 m/s. The mass of the rocket excluding payload and propellant is 2000 kg, the propellant mass is 1000 kg and the mass of the payload is 800 kg. Find the maximum velocity that can be attained by the rocket. [9+6]
- 6.a) Sketch the different thrust vector control systems used in a liquid propellant system and explain their functioning.
b) Describe the thrust termination systems usable in solid motors.
c) Is varying the thrust of a solid motor possible? How? Explain in detail. [5+5+5]
- 7.a) Describe the instrumentation required for ground testing a solid rocket motor.
b) How is the trajectory of a rocket monitored in flight? What are the ground and flight instrumentation required for this purpose? [7+8]

- 8.a) Why is aluminium used in liquid stages and not in solid motors? Explain with reasons, comparison with other materials and pertinent data.
- b) What are the parts of a satellite launch vehicle made of titanium and why? Justify the other parts not being made of titanium. [7+8]

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