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Seventh Semester B.E. Degree Examination, June/July 2016

Space Mechanics and Launch Vehicles

Time: 3 hrs.

Max. Marks: 100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. Explain Inertial co-ordinate reference frame. (05 Marks)
b. Describe construction of Euler's angles and derive expression for Euler rates. (15 Marks)
- 2 Derive a equilibrium that specifies the motion of one body relative to another body in an Inertial frame of reference. (20 Marks)
- 3 a. Derive expression for single impulse orbital transfer. (12 Marks)
b. What are sun synchronous and Geo-synchronous orbits? (08 Marks)
- 4 a. Briefly explain Hohmann orbits. (10 Marks)
b. Discuss satellite perturbations. (10 Marks)

PART – B

- 5 a. Explain the fundamental thrust equation for rocket engine performance. Derive expression for specific impulse for rocket thrust. (12 Marks)
b. Describe comparison between solid and liquid propellants. (08 Marks)
- 6 a. Describe gravity turn trajectories and write the governing equations of motion. (10 Marks)
b. Find out burnout time for a rocket with following data :
Initial mass of the rocket = 60,000kg
Mass ratio = 10
Specific impulse = 400Secs
Thrust of Rocket = 1000kN. (10 Marks)
- 7 a. Explain multistage Rocket definition. (05 Marks)
b. Describe optimal multistage Rocket staging. (15 Marks)
- 8 a. Explain preliminary spacecraft design concepts. (10 Marks)
b. What are desired structural and thermal characteristics for spacecrafts? (10 Marks)
