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10AE763

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019

Space Mechanics and Launch Vehicles

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Define and explain the following:
 - i) Earth centered inertia
 - ii) Earth centered earth fixed
 - iii) Topocentric coordinate systems with satellite

(10 Marks)
- b. Resolve the dot and cross products of a vector into its rectangular components. (10 Marks)
- 2 Derive and explain the general solution to Two Body Problem. (20 Marks)
- 3 a. Explain establishment of orbits from initial coordinates with figure. (10 Marks)
- b. Derive and explain Long-range Ballistic Trajectories. (10 Marks)
- 4 a. Explain with figures:
 - i) Geosynchronous satellites
 - ii) Sun synchronous satellites

(10 Marks)
- b. Explain Hohmann transfer orbits. (10 Marks)

PART – B

- 5 Describe the classification of Rocket engines. Explain with neat sketch Liquid propellant, Solid propellant and Hybrid propellant rocket engines. (20 Marks)
- 6 a. What do you understand by special perturbation method? (06 Marks)
- b. A satellite is in a circular orbit at 400 km attitude. The satellite has cylindrical shape of 2m in diameter and 4m in length with a mass of 1000 kg. The satellite is travelling with its long axis perpendicular to the velocity vector and $C_d = 2.67$. Calculate the perturbation due to atmospheric drag and estimate its life time. (14 Marks)
- 7 Explain Staging of Rockets, Performance of single stage Rocket with necessary equations. (20 Marks)
- 8 Write short notes on:
 - a. Manned and unmanned space mission
 - b. Life support system for manned space mission
 - c. Selection of material for spacecraft

(20 Marks)

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.