Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

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B.Tech.(ANE) (Sem.–6)

ELEMENTS OF SPACECRAFT ENGINEERING

Subject Code : ANE-323

M.Code : 60532

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION–A

1. a) What is a geostationary satellite?

b) Name various types of fuels and oxidizers used in solid propellants.

c) What are functions of missiles?

d) What is the role of strap-on boosters?

e) Why multi-stage rockets are preferred over single stage rocket?

f) Define 3rd Law of Kepler's planetary motion.

g) Name six elements which completely define an orbit.

h) Define orbital velocity.

i) What is the effect of earth oblateness on satellite orbit?

j) What is prolate satellite?

SECTION-B

2. With the help of a neat diagram, explain construction, working and salient features of a liquid rocket engine.

3. Derive Tsiolkovsky's equation for the rocket in terms of mass ratio and specific impulse of the rocket.

4. With the help of a diagram, show all the orbital elements and state and prove Kepler's 2nd law of planetary motion.

5. Explain the boost phase and ballistic phase of the trajectory of a ballistic missile.

6. A satellite in low earth orbit starts falling due to atmospheric drag. Derive an expression to estimate the time when satellite hits the ground.

SECTION-C

7. With the help of neat diagrams explain the methods for attitude control of spinning and non-spinning spacecraft.

8. The data for a two stage rocket is given as below :

   First stage : propellant mass = 3450 kg, structure mass = 400 kg.

   Second stage : propellant mass = 1000 kg, structure mass = 100 kg.

   The payload mass = 50 kg and specific impulse is 350 seconds. Calculate the burnout velocity of the rocket.

9. Write notes on :

   a) Parallel staging of rockets 3

   b) Inclination change maneuver 3

   c) Earth oblateness effect 4

NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC against the Student.