Seat No: _____ **Enrollment No: _____**

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech. Summer 2018 - 19 Examination

Semester: 8 **Date: 01/05/2019**
Subject Code: 03101452 **Time: 10:30am to 01:00pm**
Subject Name: Space Dynamics **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (All are compulsory) (Each of one mark) **(15)**

1. Any free-moving liquid in space will form itself in spherical shape, because of its _____.
2. The _____ of a satellite does not change as the satellite moves along its conic orbit.
3. Semi-major axis of parabolic path is _____.
4. Total energy constant is given by _____.
5. L/D ratio for skip re entry with lifting surfaces is_____.
6. Define Ballistic Re entry.
7. Define glide re entry.
8. Define re entry corridor.
9. What is the main cause of problems associated with re entry vehicles?
10. What is cold welding?
11. Space Station circles the Earth in
    a) 24hrs
    b) 90mins
    c) 365days
    d) 15days
12. Pressure is dependent on
    a) altitude
    b) time of day
    c) location on globe
    d) All the above
13. What is θ in Attitude kinematics
    a) Rate at which body is rotating about tilted 3 axis.
    b) Nutation angle
    c) Pitch angle
    d) Precession rate
14. Escape speed from the surface of the earth is
    a) 36000ft/sec
    b) 34000ft/sec
    c) 36700ft/sec
    d) 36400ft/sec

15. It takes _____ to change the angular momentum of a system in rotational motion about some centre of rotation.
    a) Tangential component of force
    b) Radial component of force
    c) Both a) and b)
    d) None of them

Q.2 Answer the following questions. (Attempt any three) **(15)**

A. Define Gravitational Potential Energy and derive equations for the same.

B. A radar tracking station tells us that a certain decaying weather satellite has e=0.1 and perigee altitude=200nmi. Determine its altitude at apogee, specific mechanical energy and specific angular momentum.

C. Calculate 'ΔV' required for performing Hofmann transfer between circular orbit at an altitude of 200km above earth to geostationary orbit.

D. In an inertial coordinate system, the position & velocity vectors of a satellite are $(2.5936i+5.1872j)x10^4$ft/sec and $(4.1852i+6.2778j+10.463k)\ x10^7$ft where i,j,k are unit vectors. Determine the specific mechanical energy and specific angular momentum.

Q.3 A. Derive eccentricity vector from Laplace vector. **(07)**

B. Derive energy integral from trajectory equation through conic section. **(08)**

OR

B. Derive equations for n body problem in space. **(08)**

Q.4 A. Derive Equations of motion for re entry dynamics. **(07)**

OR

A. Derive equation of attitude dynamics through rigid body dynamics. **(07)**

B. Develop attitude kinematic equations through its assumptions and considerations. **(08)**