GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VIII (NEW) EXAMINATION – WINTER 2017

Subject Code: 2180103   **Date: 10/11/2017**

Subject Name: Space Dynamics

Time:02:30 PM TO 05:00 PM   **Total Marks: 70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	There is gravity in space. True or False? Explain.	**03**
	(b)	What do you mean by zero potential energy?	**04**
	(c)	Explain Newton's law of gravitation in detail.	**07**
Q.2	**(a)**	What velocity required for a circular orbit around the earth?	**03**
	(b)	State and Prove Kepler's third law.	**04**
	(c)	Write a note on Circular orbit. List down important points.	**07**
	(c)	Write a short note on Hohmann transfer ellipse.	**07**
Q.3	**(a)**	Write down statements of Kepler's 1st and 2nd laws.	**03**
	(b)	Write a short note on Escape Velocity.	**04**
	(c)	A satellite is launched from a circular equatorial parking orbit at an altitude of 160 km into a coplanar circular synchronous orbit by using a Hohmann transfer ellipse. Assume a homogeneous spherical earth with a radius of 6370 km. Determine the velocity increments for entering the transfer ellipse and for achieving the synchronous orbit at 45,000 km altitude.	**07**
Q.3	**(a)**	Calculate escape velocity required for a body to escape from the earth's atmosphere.	**03**
	(b)	Classify Space vehicles.	**04**
	(c)	Derive general equation of motion for a vehicle entering the atmosphere. Based on ballistic parameter plot the entry trajectory on a velocity altitude map..	**07**
Q.4	**(a)**	The period of revolution of the earth about the sun is 365.256 days. The semi major axis of earth's orbit is 1.49527×10^{11} m. In turn, the semi major axis of the orbit of Mars is 2.2783×10^{11} m. Calculate the period of Mars.	**03**
	(b)	With neat sketch explain different types of trajectories.	**04**
	(c)	Write a note on the Two-body problem.	**07**
Q.4	**(a)**	Explain different types of entry paths.	**03**
	(b)	Compare Slender body and blunt body for entry heating performance.	**04**
	(c)	Prove that aerodynamic heating rate varies as the cube of the velocity.	**07**

Q.5 **(a)** What do you mean by Attitude Maneuver? Name the methods of its measurement? **03**

(b) Write a note on Elliptic orbits. **04**

(c) Derive Orbit equation. **07**

Q.5 **(a)** Explain the concept of Rigid body. **03**

(b) Explain briefly magnetic disturbance torque acting on vehicle revolving in earth's orbit. **04**

(c) Explain the following equation of external force acting on rigid body using Newton's Law of Motion. **07**

$$F_e = M \times \frac{d^2 r_c}{dt^2},$$ Where r_c= Position of centre of mass

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