Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

V SEMESTER B.TECH. (AERONAUTICAL ENGINEERING)

END SEMESTER EXAMINATIONS,NOV/DEC 2016

SUBJECT: ORBITAL MECHANICS [AAE 4012]

REVISED CREDIT SYSTEM
(03/12/2016)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A. What are the contributions of Tyco Brahe for the development of Celestial Mechanics? **(2)**

1B. Use the two-body equations of motion to show why orbiting astronauts experience weightlessness **(3)**

1C. State and prove Kepler's law of ellipses. **(5)**

2A. Explain the term phasing maneuver. **(2)**

2B. Explain bi-elliptical transfer with proper diagram. **(3)**

2C. A 2000 kg spacecraft is in a 480 km by 800 km earth orbit. Find
(a) The Δ v required at perigee A to place the spacecraft in a 480 km by 16,000 km transfer ellipse (orbit 2).
(b) The Δ v (apogee kick) required at B of the transfer orbit to establish a circular orbit of 16,000 km altitude (orbit 3). **(5)**

3A. Calculate synodic period of Mars relative to Earth.Period of Mars is 687.99 days **(2)**

3B. Explain patched conic method with proper diagram. **(3)**

3C. Derive the expression for Sphere Of Influence (SOI) of a planet **(5)**

4A. Explain sidereal time. **(2)**

4B. What are Lagrange points? What is its significance? **(3)**

4C. Explain Gibb's method for orbit determination. **(5)**

5A. Explain phase angle in the context of orbital rendezvous. **(2)**

5B. Explain gravity assist orbital maneuver **(3)**

5C. What are the various perturbation factors affecting the satellites? **(5)**