USN

2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY

IV B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS
SPACE MACHANICS
(AERONAUTICAL ENGINEERING)

JULY- 2005

TIME: 3 HOURS

MAX MARKS: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Explain in detail regarding
i. co-ordinate systems in space and
ii. Classi¯cation of planets.

(b) Explain how celestial sphere concept is used in studying motion of an object in the sky.

2. Show that the speed of a satellite in a circular orbit is vc = [(¹=r)]0:5: Compare this to escape velocity at the same radius. Calculate vcandvesc at r = 6578 km (200 km altitude) and at r = 385,000 km (the distance to the moon).

3. (a) Explain in detail the terms
i. Gravity assist maneuvers and
ii. Time of °ight

(b) The elements of the Magellan mapping orbit about Venus are as follows: a = 10,400 km and e = 0.4. The mapping pass is started at a true anomaly of 2800. Find out the altitude, °ight path velocity, velocity and time since periapsis at this point.

4. Discuss in detail about
(a) Longitude station-keeping and
(b) Latitude station-keeping

5. A satellite is in a circular orbit with a period of 90 minutes and an inclination of 96.580. Calculate the altitude of the orbit and the change in the line of nodes due to theJ2 gravity perturbation.

6. (a) Write a short note on
i. Hyperbolic excess velocity and c3,
ii. V1attheplanet:

(b) Classify the planetary trajectories based on the length of the transfer ellipse.

7. Write short notes on
(a) boost phase,
(b) free fall phase, and
(c) re-entry phase.

8. Discuss in detail about ¯bre reinforced and metal matrix composite materials.