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**2005 JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY****IV B.TECH II SEMESTER SUPPLEMENTARY EXAMINATIONS  
SPACE MECHANICS  
(AERONAUTICAL ENGINEERING)**

JULY- 2005

TIME: 3 HOURS

MAX MARKS: 80

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**Answer any FIVE Questions**  
**All Questions carry equal marks**  
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1. (a) A satellite is in an elliptical orbit, which brings it to an altitude of 200 km at perigee and out to an altitude of 1500 km at apogee. Calculate the velocity of the satellite at both perigee and apogee.  
(b) Derive the equation by using two-point method on an ellipse for finding velocity of an object at periapsis and apoapsis.
2. (a) List out various elements and bring out the significance of parabolic and hyperbolic orbits.  
(b) Discuss about the following:
  - i. The many body problem
  - ii. Circular restricted 3-body problem
3. (a) Discuss in detail the circular restricted three body problem and state all the assumptions.  
(b) Write down different types of satellite orbits usually used by ISRO.
4. How can we classify the perturbation/variation in the orbital elements based on their effect on Keplerian elements? Discuss in detail each variation and its effects.
5. Explain in detail different types of perturbations.
6. Give a detailed account of ephemeris calculations.
7. Desired range 10120 km ( $\tilde{\Delta} = 90:900$ ) to a target takes a long way round to the target  $\tilde{\Delta} = 269:080$ :
  - (a) Find  $\tilde{\Delta}60$ ; and
  - (b) compare the long and short trajectory characteristics.
8. Discuss in detail about fibre reinforced and metal matrix composite materials.