# Space Flight Mechanics

P. Pages : 2

**TKN/KS/16/7611**

Time : Three Hours

\*0962\*

Max. Marks : 80

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Notes : 1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No.2.
3. Solve Question 3 OR Questions No.4.
4. Solve Question 5 OR Questions No.6.
5. Solve Question 7 OR Questions No.8.
6. Solve Question 9 OR Questions No.10.
7. Solve Question 11 OR Questions No.12.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. a) Explain about solar system in detail. **7**

   b) Calculate the velocity of an artificial satellite orbiting the earth in a circular orbit at an altitude of 200 Km. above the earth's surface. **6**

**OR**

2. a) How do you define reference frames in term of velocity and acceleration? **6**

   b) What is basic difference between sidereal, solar and standard time? Explain with the help of neat sketch. **7**

3. a) Explain the N-Body problem with the help of suitable diagram and expression. **7**

   b) A satellite in earth orbit has a semi-major axis of 6700Km. and an eccentricity of 0.01. Calculate the satellite's altitude at both perigee and apogee? **6**

**OR**

4. a) Define Lagrange points in terms of three-body problem. **6**

   b) Explain in detail the three-body problem. **7**

5. a) With the help of neat sketch and diagram explain in detail Hohmann transfer orbit. **7**

   b) Derive a suitable derivation on Cowell's method for perturbed satellite orbit. **6**

**OR**

6. a) Write down a special general perturbations approach? **6**

   b) Derive transfer and inverse transfer matrix in term of Euler's Angles. **7**

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| **7.** | a) | Explain in detail about three-dimensional interplanetary trajectories. | **7** |
| | b) | What are the basic concept of interplanetary trajectories? | **6** |

**OR**

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|---|---|---|---|
| **8.** | a) | Explain in detail about fast interplanetary trajectories. | **5** |
| | b) | What are the parameters to launch a satellite from earth to orbit? Explain in detail. | **8** |
| **9.** | a) | Derive a suitable expression for single-stage rocket. | **8** |
| | b) | Explain boost phase in terms of ballistic missile trajectories. | **6** |

**OR**

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| **10.** | a) | What are the influence coefficients in trajectory geometry? | **8** |
| | b) | Derive the expression for position of the impact point for spherical earth. | **6** |
| **11.** | | What are the criteria's for selecting a material for spacecraft? | **14** |

**OR**

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| **12.** | | Write a short notes on: | **14** |
| | i) | Polymer – matrix composite material. | |
| | ii) | Carbon – carbon composite material. | |

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