

- ✓ 1. Geosynchronous circular orbit is used for communication satellite which appears stationary with respect to a fixed point on earth's surface. Determine its altitude above the surface of the earth.
- ✓ 2. Determine the eccentricity of an elliptic orbit, which has $(r_p/r_a) = 0.5$. ✓3
- ✓ 3. Determine the velocity at perigee for an orbit with $a = 7.0 \times 10^6$ m and $e = 0.35$.
- ✓ 4. A spacecraft is injected at an altitude of 400 km above earth's surface, with a velocity of 8.5 km/s, which is at an angle of 5° with the local horizon. Determine the semi-major axis and eccentricity of the orbit formed. In what way would the orbit change if the angle with local horizon is zero?
- ✓ 5. Halley's Comet passed its perihelion last time on February 9, 1986. It has its semi-major axis of 17.834 AU and eccentricity of 0.96714. Solve the Kepler's equation and determine eccentric, mean and true angles as well as the radial distance from sun for March 24, 2020.

Astronomical Constants

$$\mu_{\text{Earth}} = 3.986005 \times 10^{14} \text{ m}^3 \text{ s}^{-2};$$

$$R_E = 6,378 \text{ km}; \quad 1 \text{ AU} = 1.495978 \times 10^{11} \text{ m};$$

$$\mu_{\text{Sun}} = 1.32713 \times 10^{20} \text{ m}^3 \text{ s}^{-2};$$

$$\text{Sidereal Day} = 23\text{h } 56\text{m } 4.09\text{s} = 23.94 \text{ hrs}$$

$$1 \text{ DU} = 6,378 \text{ km} \quad 1 \text{ SU} = 7,905 \text{ m/s};$$

$$1 \text{ TU} = 806.8\text{s}; \quad \mu_E = 1 \text{ DU}^3 / 1 \text{ TU}^2 = 1$$