Short theoretical questions – reserve

16. Give the focal length of the eyepiece needed to best see the faintest nebulae through a telescope with an objective lens of diameter 8 cm and focal length 40 cm.

17. Due to the intrinsic variability of the Sun, the Solar irradiance varies from 1362 Wm^{-2} to 1368 Wm^{-2}, and the effective temperature by up to 1.5 K. What is the maximum change of the Solar radius which could accompany these variations?

18. Consider a planetoid of spherical mass distribution and average density ϱ rotating abut its axis with a period less than

$$T = \sqrt{(3\pi/G\,\varrho)}$$

Determine the lowest planetoidographic latitude which would allow landing on this body.

19. Observations of a satellite show that it travels from the zenith to an altitude of $h = 40^{\circ}$ in time $\Delta t = 105$ s. Determine the orbital period T and radius of the circular orbit R for the satellite.

Ignore the rotation of the Earth. Note that the speed of a satellite in a circular orbit of radius equal to the radius of the Earth (also called the 'first space velocity') is $v_I = 7.91$ km s^{-1}.

20. For any date in the Gregorian calendar, the Julian day number (JD) can be determined by the algorithm:

A = Int ((M + 9) / 12) + Y + 4716

B = Int (275 M / 9) – Int (7 A / 4) + 367 Y + D +1 729 317.5

C = Int ((A + 83) / 100)

JD = B – Int (3 (C +1) / 4)

(where: Y – year, M – month, D – day, Int ( ) – integer part)

Determine the day of the week and the date (day, month, year) of birth of Jan Hevelius, if we know that:

– it was the Julian Day which began on: JD = 2 309 492.5
– 28 August 2011 roku is a Sunday according to the Gregorian calendar.