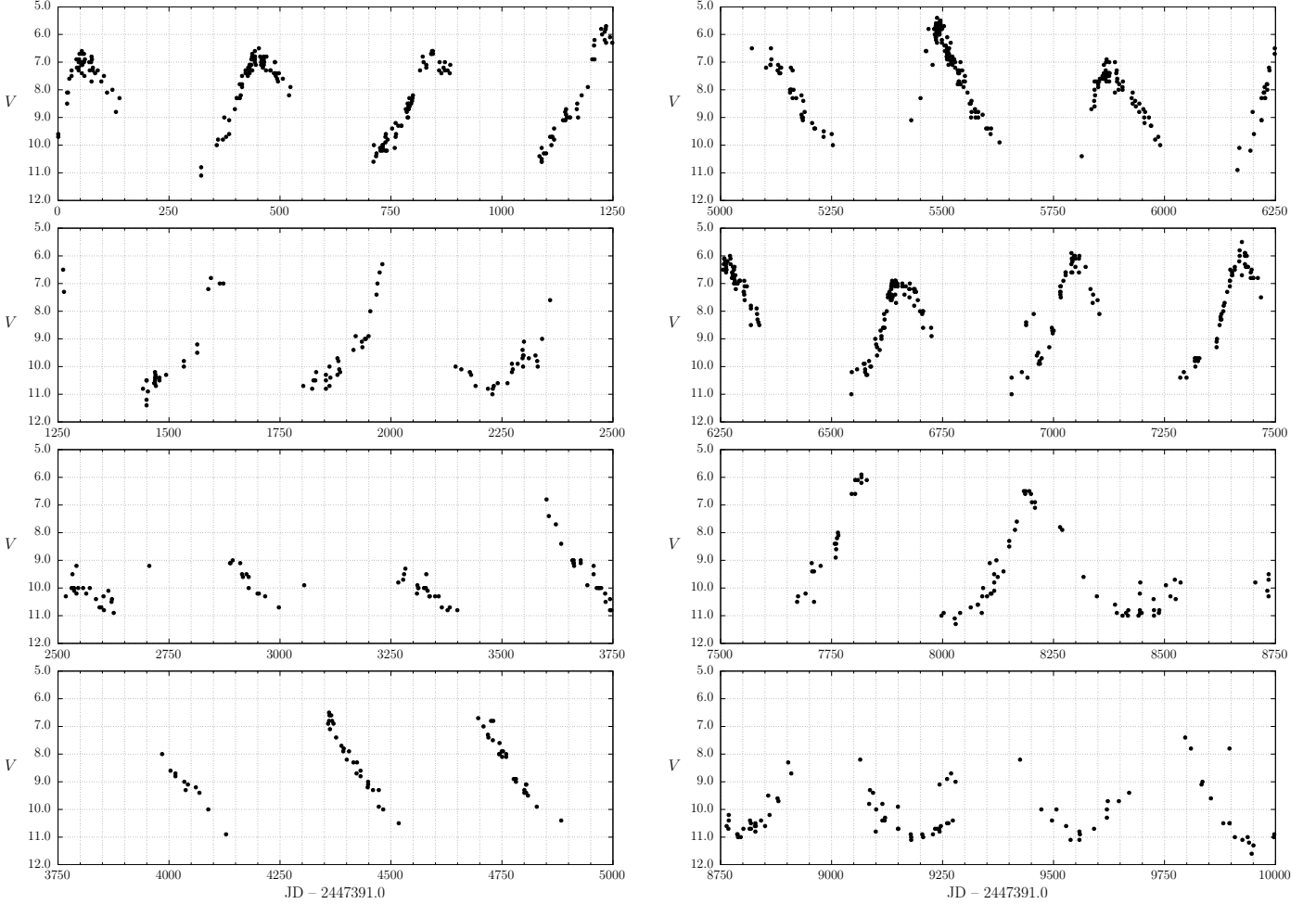


PROBLEM No. 2

The figures show the light curve of a variable star based on visual brightness (V) estimates by the members of the variable star section of Hungarian Astronomical Association. It is clearly seen that the light curve is periodic.



- Estimate the period of the light curve in days and its error. (35 p)
- Estimate the amplitude of the brightness variation in magnitude. (5 p)
- What kind of variable star could produce brightness variation and light curve with such a period and amplitude? (5 p)

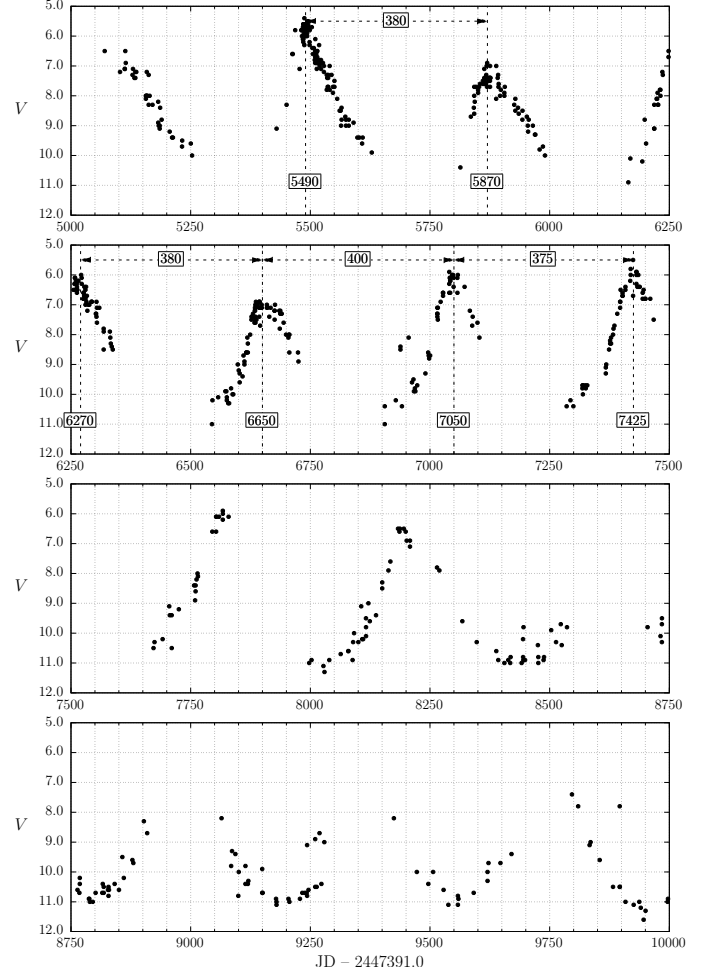
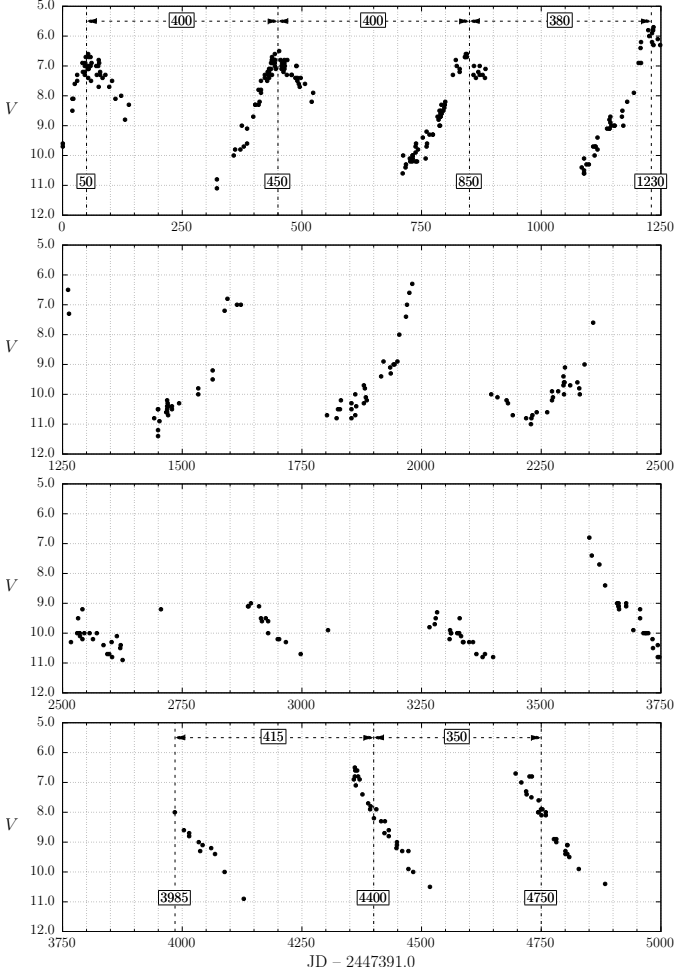
(45 p)

SOLUTION:

- a) The estimated dates and differences between them are shown in the figures below.

12 maxima (4 on the panel L1, 2 on the panel R1, and 4 on the panel R2), and 3 "8^m-values" (panel L4) were used, and 9 differences between them were calculated:

400, 400, 380, 415, 350, 380, 380, 400, 375



The mean value of the differences is 386.7, while the standard deviation is 19.2, so the estimated period of the light curve:

$$P = 386.7^{\text{d}} \pm 19.2^{\text{d}} \quad (35 \text{ p})$$

- b) The brightness maxima and minima slightly change with time, but most of the values are between 5.5^m and 11.5^m, so the amplitude of the light curve

$$\Delta m \approx 6^{\text{m}} \quad (5 \text{ p})$$

- c) Mira type variable

(5 p)

The actual star is the main component of the symbiotic binary R Aquarii, a Mira type pulsating variable with a pulsation period of $P \approx 387^{\text{d}}$ from the literature.