Stars and Galaxies

Observational Techniques Homework Set 1

All five questions are from previous exam papers

1) A star with an apparent magnitude of 10.0 undergoes an outburst and triples in luminosity for a short period of time. What is the apparent magnitude of the star during this outburst? [1 mark]

2) Name two commonly used telescope foci and state and advantage of each focus position. [2 marks]

3) Calculate the focal ratio of a 8 meter telescope which has a plate scale of $2.34\,\mathrm{arcsec\,mm^{-1}}$ [2 marks]

4) A 4-m reflecting telescope has f-ratio $f/3$ at prime focus. What is the maximum field-of-view in arcseconds that could be achieved by a detector that is 1000 pixels across and where each pixel is square of side 15μm? [2 marks]

5) *(i)* Calculate the resolution limit of a 8 meter telescope in the V-band (with a central wavelength of 550 nm) in the diffraction limited case. Give your answer in milli-arcseconds. [1 mark]

(ii) A V-band image of a star is recorded using this telescope fitting with a detector with pixels which are $20\,\mu\mathrm{m} \times 20\,\mu\mathrm{m}$ in size. The effective focal length of the telescope is 500 m. Calculate approximately how many pixels the image of the star will cover. [2 marks]