Tutor Marked Assignment

Make sure you know how to complete and send in your TMA and PT3 form:
detailed instructions are given in your student handbook (or supplement).

This assignment consists of four questions.

**You are strongly advised to do Questions 1 and 2
before you embark on your study of Block 2.**

Question 1

*This question relates to the project work, and carries
50% of the marks for this assignment.*

This question is centred on project write-up. IT IS
MOST IMPORTANT that you follow the advice given
in Section 2.5 of the *Project file*, including the
organization of a write-up into sections, and the
suggested lengths of each section. *The total length of
your write-up should not exceed about 1200 words, plus
sketches and graphs.*

There are two options – **CHOOSE ONLY ONE OF
THEM.**

Option 1

Present your write-up of the project *The difference in
length between the sidereal day and the mean solar day.*

Option 2

Present your write-up of the project *The luminosity of
the Sun.*

For Option 1 only, you can use back-up data that we
supply on your request (see the *Project file* for details).
If you choose Option 1, and your write-up is based on
the back-up data, then all marks are still available to you
provided that (under observational/measurement
procedure)

- you include a description of any observational
  efforts of your own, and/or your reasons for
  resorting to our data;

- you describe our data, and how you used them.

If you did not obtain our data, yet have insufficient data
of your own for a full write-up, then proceed as far as
you can – some marks will still be available.

Question 2

*This question relates to Block 1 Chapters 3 and 4, and
carries 20% of the marks for this assignment.*

Very recent work with a new technique called optical
aperture synthesis suggests that hot spots are routinely
found on the surface of red supergiants. Betelgeuse is a
red supergiant with a surface temperature of
approximately 3 500 K. It has been discovered that 15%
of the luminosity of Betelgeuse is from a spot with a
temperature 400 K above that of the rest of the surface.
Estimate roughly what percentage of the area of
Betelgeuse is occupied by this spot, showing the method
you have used. Compare this spot with a sunspot.

Question 3

*This question relates mostly to Book 2 Chapter 1, but
also draws on some things you met in Book 1. It carries
20% of the marks for this assignment.*

As you may have already seen in the *Yearbook*, in
August 1993 the spaceprobe *Galileo*, which was then on
its way to the Jupiter system, made a close fly-by past
the asteroid 243 Ida. The *Galileo* imaging team were
surprised (and pleased) to find that many of the images
of Ida that *Galileo* transmitted back to Earth also
showed a small body, about 1.6 km across, that was
evidently in orbit about Ida. One of these images is
shown in Figure 1. The International Astronomical
Union has adopted the name Dactyl for this satellite of
Ida. Before you attempt this question, you need to read
the following text about Dactyl's discovery and its
implications, which is extracted from an article that
appeared in the popular astronomy magazine *Sky and
Telescope* in 1995.

> The Galileo imaging team realized right away that if
> they could determine the size and period of the little
> moon's orbit, Kepler's third law would yield the mass
> of Ida. This value, divided by Ida's volume, would
> give its overall density – the first clue to composition.
> Without Dactyl, Ida's density can only be guessed at,
> since *Galileo* flew by too fast (12.4 km per second)
> and too far away (2 400 km) to be affected perceptibly
> by the asteroid's gravity.