Computer Marked Assignment

Course and assignment number:
S281 41

Make sure you know how to use the CMA form: detailed instructions are given in your student handbook (or supplement).
You are strongly advised to attempt every question in this assignment.
If you do not wish to answer a question, pencil across the 'don't know' cell ('?').
If you think that a question is unsound in any way, pencil across the 'unsound' cell ('U') *in addition to* pencilling across either an answer cell or the 'don't know' cell.
Note For each question, you **must** *pencil across* **either** *the required number of answer cells* **or** *the 'don't know' cell.*

Covering: **Block 1**

Cut-off date:
Friday 26 April 1996

PART A

This part relates to Block 1 Chapters 1–3, and carries 50% of the marks for this assignment.

Q1 The star ε Indi belongs to spectral class K5. At what wavelength would you expect the Planck curve of this star to have a maximum?

KEY for Q1
A 0.64 m
B 1.5×10^6 m
C 640 nm
D 17.55 nm
E 5.8×10^{-7} m
F 7 700 nm

Pencil across *one* cell in row 1.

Q2 In what region of the electromagnetic spectrum does the maximum in Q1 lie?

KEY for Q2
A X-ray
B Ultraviolet
C Visible
D Infrared
E Radio
F Microwave

Pencil across *one* cell in row 2.

Q3 Why is the corona of the Sun observed only at times of eclipse or with a coronagraph? Select *one* reason from the key.

KEY for Q3
A The temperature of the solar corona is higher than that of the photosphere.
B Radiation at visible wavelengths is not emitted by the coronal gases.
C The coronal gas is very tenuous.
D An ideal thermal source at the temperature of the corona has the peak in its spectrum at shorter wavelengths than visible radiation.
E The corona scatters visible light from the photosphere.

Pencil across *one* cell in row 3.

Q4 A binary system consists of two stars with masses in the ratio 2 : 1. The orbital period is 248 years and the semi-major axis of the orbit of one star with respect to the other is 34 AU. Calculate the mass of the less massive star.

KEY for Q4
A $0.14M_\odot$
B $0.019M_\odot$
C $6.3 \times 10^{-3}M_\odot$
D $13\,200M_\odot$
E $4\,400M_\odot$
F $0.64M_\odot$
G $0.21M_\odot$
H There is insufficient information to calculate the mass.

Pencil across *one* cell in row 4.

Q5 Observations of the Hα absorption line from the star Ross 47 yield an observed frequency of 1.569×10^{11} Hz higher than the laboratory frequency of 4.568×10^{14} Hz (i.e. an observed wavelength 0.023 nm shorter than the laboratory wavelength of 656.3 nm). What is the magnitude of the radial velocity of the star? Select from the key the value closest to yours, and pencil across *one* of the cells A–F in row 5. Is Ross 47 moving away from or towards the Earth? Choose *one* option from the cells G and H.

KEY for Q5
A $30\,000$ km s^{-1}
B 302 km s^{-1}
C 10.5 km s^{-1}
D 8.7×10^5 km s^{-1}
E 103 km s^{-1}
F 3.4×10^{-4} km s^{-1}
G Towards the Earth
H Away from the Earth

Pencil across *one* of the cells A–F and *one* of G–H in row 5.