所別：天文研究所碩士班 不分組 科目：天文學

(1) (20 points)
Write down the value of the following ten items (each carries 2 points):
(a) What is one solar mass in kilograms?
(b) What is one solar luminosity in SI units?
(c) What is the size of the Sun in meters?
(d) What is one astronomical unit in metres?
(e) What is one parsec in metres?
(f) What is the distance between the solar system and the centre of the Milky Way in parsec?
(g) What is the age of the Sun in years?
(h) What is the age of the universe in years?
(i) What is the temperature of the photosphere of the Sun in Kelvin?
(j) What is the temperature of the cosmic microwave background now in Kelvin?

(2) (20 points)
(a) (4 points) What are apparent magnitude and absolute magnitude? Write down the relation between them.
(b) (4 points) What are interstellar extinction and reddening?
(c) (12 points) What is a Hertzsprung-Russell diagram? Draw the location of the following astrophysical objects on a Hertzsprung-Russell diagram. (i) Bernard's star (0.1 solar mass main sequence star), (ii) the Sun (1 solar mass main sequence star), (iii) β Centauri (15 solar mass main sequence star), (iv) Betelgeuse (red supergaint), (v) Sirius B (white dwarf), and (vi) δ Cephei (Cepheid variable star).

(3) (20 points)
List three different types of information one can obtain from the spectrum of a star. Describe in detail the physics and method behind each of them.

(4) (10 points)
Describe at least five different properties between high mass and low mass stars.

(5) (10 points)
Describe how you will proceed to measure the mass of the Sun. Explain in detail the approximations you have made in your procedure.

(6) (10 points)
What are the Hubble sequence of galaxies? Write down as much as you can on the differences between different types of galaxies.

(7) (10 points)
One piece of evidence that dark matter exist is the rotation curve of spiral galaxies.
(a) (2 points) Draw the rotation curve of the Milky Way.
(b) (8 points) Suppose the Milky Way is dominated by a spherical distribution of dark matter. Find the density distribution of the dark matter to explain the rotation curve. Draw the density distribution of the dark matter halo.