

## 普通天文學 2014 年春 期末考

2014.06.12 10 : 00 ~ 11 : 50

1. (Total 20%) The Sun has a rotational period of about 30 days. How is this measured? (5%) Given the radius of the Sun of 700,000 km, and assuming conservation of angular momentum, estimate how fast the Sun would rotate if it were to shrink to a radius of 15 km, the size equivalent to that of a neutron star. (5%) A pulsar is found at the center of the Crab Nebula, the remnant of a supernova explosion recorded in the year 1054. What is a supernova? (5%) What is a pulsar and how is it related to a neutron star? (5%)
2. (Total 30%) Describe the "spiral arms" of the Milky Way and other similar galaxies. What makes the spiral pattern visible? (10%) Give one theoretical explanation for the formation of the spiral pattern. (5%) Galaxies can be classified in terms of their appearances: elliptical, spiral, or irregular. Compare their gas contents and star formation activities. (10%) Which class do the Milky Way galaxy, M31 (the Andromeda galaxy), and Large Magellanic galaxy belong to? (5%)
3. (Total 30%) Modern cosmology suggests that the universe begins with an energetic event, called the Big Bang. Give three independent pieces of evidence that the Big Bang ever occurred? (10%) Using the following key words, arranged in order of time, of the major events in the universe, the cosmic "arrow of time", since the Big Bang: *Planck era*, *inflation*, *decoupling*, *dark age*, describe briefly each of these events and when it occurred. (10%) From the latest estimate of the Hubble constant  $H_0 = 73$  km/s/Mpc, estimate the age of the universe. (10%)
4. (Total 20%) In addition to the regular matter, the universe is believed to fill with "dark matter" and "dark energy". Describe the observational evidence of the existence of the dark matter and of the dark energy. (15%) To our current knowledge, what is the nature of the dark matter? What is the dark energy?

恭喜各位完成一年的普通天文學課程，希望尋找問題與探討答案的過程不僅止於課堂，求知的習慣也不限於宇宙現象。

請不要忘了填寫課程評量。祝假期充實而愉快！