

M.Sc. (Physics) Semester – III
PHYS-555 ASTRONOMY & ASTROPHYSICS – I
Internal Assessment – 2017

Max Marks : 30

Time : 1.5 Hours

Attempt any 10 questions from Part –A carrying 1 mark each. Write only the correct answer in your answer book. Attempt any 10 questions from Part –B, which carry 2 marks each.

PART – A

1. What is the altitude of the Sun at noon on the day of the autumnal equinox at 30° North latitude?
 - a) 23.5°
 - b) 30°
 - c) 66.5°
 - d) 60°

2. In what region of Earth would you have to be to have the Sun pass through your zenith at some time during the year?
 - a) within the Arctic Circle
 - b) at any latitude
 - c) within $\pm 23.5^{\circ}$ of the equator—the tropics
 - d) only on the equator, nowhere else

3. At a particular time, the vernal equinox passes through the celestial meridian of an observer. What is the sidereal time at that site?
 - a) 12 hours exactly
 - b) 0 hours exactly
 - c) variable, depending on the observer's latitude
 - d) variable, depending on the time of year

4. At what approximate value of declination was the Sun on March 21 this year?
 - a) 0°
 - b) 23.5°
 - c) 180°
 - d) 90°

5. Angular distance between a point and the closest pole as measured along the meridian passing through the point is called
 - a) longitude
 - b) zenith distance
 - c) co-latitude
 - d) altitude

6. If the distance between us and a star is doubled, the Luminosity of the star
 - a) Decreases by a factor of four, and the apparent brightness decreases by a factor of four
 - b) Decreases by a factor of two, and the apparent brightness decreases by a factor of two
 - c) Remains the same, but the apparent brightness decreases by a factor of two
 - d) Decreases by a factor of four, but the apparent brightness remains the same
 - e) Remains the same, but the apparent brightness decreases by a factor of four

7. Star A is identical to Star B, except that Star A is twice as far from us as Star B. Therefore:
 - a) both stars have the same luminosity, but the apparent brightness of Star B is twice that of Star A.
 - b) both stars have the same apparent brightness, but the luminosity of Star B is four times that of Star A.
 - c) both stars have the same luminosity, but the apparent brightness of Star A is four times that of Star B.
 - d) both stars have the same luminosity, but the apparent brightness of Star B is four times that of Star A.

8. Which of the following is true about low-mass stars compared to high-mass stars?
 - a) Low-mass stars are cooler and less luminous than high-mass stars.
 - b) Low-mass stars are hotter and more luminous than high-mass stars.
 - c) Low-mass stars are cooler but more luminous than high-mass stars.
 - d) Low-mass stars are hotter but less luminous than high-mass stars.
 - e) Low-mass stars have the same temperature and luminosity as high-mass stars.

9. Which of the following luminosity classes refers to stars on the main sequence?
- I
 - II
 - III
 - IV
 - V
10. The choices below each describe the appearance of an H-R diagram for a different star cluster. Which cluster is the youngest?
- The diagram shows main-sequence stars of spectral types G, K, and M, along with numerous giants and white dwarfs.
 - The diagram shows main-sequence stars of all the spectral types except O and B, along with a few giants and supergiants.
 - The diagram shows main-sequence stars of every spectral type except O, along with a few giants and supergiants.
 - The diagram shows no main-sequence stars at all, but it has numerous supergiants and white dwarfs.
11. If two stars are on the main sequence, and one is more luminous than the other, we can be sure that
- more luminous star will have the longer lifetime
 - fainter star is the more massive
 - more luminous star is the more massive
 - more luminous star will have the redder color
 - all the above statements are false

PART - B

12. Determine the right ascension (RA) and declination (DEC) of
- Vernal equinox
 - North ecliptic pole
 - South ecliptic pole
13. Show by way of a diagram and explanation that the altitude of the north celestial pole (NCP) from Delhi is around 28° .
14. Calculate the declination of a star which is circumpolar at a latitude 60° N.
15. The zenith distance of a star at latitude 60° N is 20° . Calculate its declination.
16. Given below are some parameters for five stars:

Star	m_v	M_v	d (pc)	Parallax (sec of arc)
65 Tau	4.2			0.025
HR 4621	2.6	-0.3		
α Pic		1.8	20	
58 Ori		-6.0		0.005
HR 2491	-1.5		2.5	

- which star would appear faintest in the night sky?
 - which star has the greatest luminosity?
 - which star is the closest to Earth?
17. Two stars are observed to have the same apparent brightness in the night sky. It is determined that star A has a luminosity of 0.5 solar units and star B has a luminosity of 4.5 solar units. Which star is more distant, and how much farther away is it than the other?
18. How many stars of 11th magnitude in a small cluster would it take for the cluster to appear as bright as a single 6th magnitude star?
19. The total magnitude of a triple star is 0.0. Two of its components have magnitudes 1.0 and 2.0. What is the magnitude of the third component?
20. How can you determine the Luminosity classes of stars from their spectra? What are the differences and similarities in the spectrum of a G2I and the spectrum of a G2V star.
21. Of the seven spectral types (O, B, A, F, G, K, M) which of the following have the given characteristics:
- Temperature of 100,000 K
 - Identical with our Sun
 - Strongest Hydrogen lines
 - Molecules present
 - Neutral Helium lines
22. A pulse counting photometer is used to obtain B and V band counts for a star and the values obtained are 2592 and 3087 respectively. What is the color index of the star.