Total number of printed pages–7

3 (Sem–6/CBCS) PHY HE 4

2025

PHYSICS

(Honours Elective)

Paper : PHY–HE–6046

(Astronomy and Astrophysics)

Full Marks : 80

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Answer the following questions : 1×10=10

   (a) Write Parse in terms of Astronomical unit.

   (b) What is distance ladder in cosmology ?

   (c) Which coordinate does not change with time ?

      (i) Declination

      (ii) Hour angle

(iii) Altitude

(iv) Azimuth

(d) For a group of stars, the luminosity is found to vary as the fourth power of the mass of star. When the ratio of masses of two stars is $\sqrt{2}$, the ratio of their Luminosities is

(i) 2

(ii) 4

(iii) 8

(iv) 16

(e) Write the sequence of clssification of stars.

(f) What is Aladin ?

(g) Define f-number of a Telescope.

(h) What are lenticular galaxis ?

(i) How does Sun produce energy ?

(j) What is Asteroid belt ? What is its shape ?

2. Answer the following questions : 2×5=10

(a) The absolute magnitude of a star is +1. Calculate its distance so that the apparent magnitude of the star is –1.

(b) Calculate the resolving power of a telescope having a diameter of 2.34 *m*, when a radiation of wavelength 5500Å is detected.

(c) What are the major regions in the solar interior ? Draw a schematic view of the sun showing the regions.

(d) Write the difference between asteroids and meteoroids.

(e) What is white dwarf stars ? How the mass of the white dwarf varies with radius ?

3. Answer ***any four*** questions from the following : 5×4=20

(a) Define the astronomical unit, the light year and the parsec. If parallax of a star is measured to be 0.6 arc-second then calculate the distance of the star in astronomical unit. 1+1+1+2=5

(b) Calculate the ratio of the radiant fluxes received from two stars whose apparent magnitude differ by 2.5.

(c) Write the relation between Luminosity and Mass of a main sequence star. Using this relation explain why lifetime of a massive star is shorter. 1+4=5

(d) Describe the sequence of reactions in the Carbon-Nitrogen-Oxygen (CNO) cycle for production of energy of a star.

(e) Explain Hubble's scheme of galaxy classification. What class has been assigned to the milky way of Galaxy? 3+2=5

(f) State Hubble's law of expanding universe and explain how Hubble's constant indicates the age of the universe. 2+3=5

4. Answer ***any four*** questions from the following : 10×4=40

(a) (i) Write the equation of hydrostatic equilibrium of a star. From this equation obtain the relation between potential and kinetic energy of a star. 1+6=7

(ii) Explain how neutron stars are formed due to Supernova explossion. 3

(b) (i) What do you mean by main sequence stars? Write down the spectral class of stars. In which class the Sun belongs to? 1+1+1=3

(ii) Name the three layers of solar atmosphere. Explain the layers briefly. 7

(c) (i) What is a celestial sphere ? For a celestial sphere define celestial poles, celestial equator and celestial meridian. Draw a diagram showing these. 5

(ii) Describe the altazimuth coordinate system used in positional astronomy. 5

(d) (i) What is light gathering power of a telescope ? Compare the light gath ring powers of the 8*m* telescope and 0.8*m* telescope. 2+3=5

(ii) Draw a schematic ray diagram of a Hubble Space Telescope. Explain how this telescope overcome the drawback of Land-based Telescope. 2+3=5

(e) (i) What are cepheid variable stars ? Why are they called standard candles. 5

(ii) Write the major differences between the elliptical and spiral galaxies. 5

(f) What are active galaxies ? Explain how active galaxies are classified. What is the source of its activity ? 1+7+2=10

(g) Discuss qualitatively the different stages in the evolution of a star.

(h) Write short notes on *any two* of the following : 5×2=10

(i) Hertzsprung–Russell (H-R) diagram

(ii) Black holes

(iii) Cosmic Microwave Background

(iv) Galactic centre and its property