3 (Sem–6/CBCS) PHY HE 4

2024

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) Convert 1 per sec into astronomical unit.

   (b) Write the value of mass of a neutron star.

   (c) For the absolute magnitude, the distance of objects from the observer is

   (A) 1*AU* *(B)* 10*AU* *(C)* 1*PC* *(D)* 10*PC*

(d) Write the Chandrasekhar limit for white dwarf mass.

(e) What is solar corona ?

(f) What are Lenticular galaxis ?

(g) Distinguish between sidereal and solar time.

(h) State the cosmological principle.

(i) How the lifetime of a star on the main sequence varies with mass ?

(j) Define an asteroid.

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

(a) A particular star has apparent and absolute magnitudes as −0·3 and +4·1. Calculate the distance in Astronomical unit.

(b) A 100*m* radio dish is used for detection of 18*cm* radiation of OH molecule. Calculate the resolving power of radio telescope.

(c) What is the declination of celestial equator and the celestial pole. What is right ascension ?

(d) Draw a schematic ray diagram of a Newtonian reflecting telescope.

(e) What are radio galaxies ? What do radio galaxies do ?

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

(a) Define Luminosity and Radiant flux of a star. Calculate the ratio of the radiant fluxes received from two stars whose apparent magnitudes differ by 2·5. 1+1+3=5

(b) What is H–R diagram ? Sketch H–R diagram showing all groups of stars. What information about the star, the H–R diagram provides ? 1+2+2=5

(c) What is Milky Way ? What are the components of Milky Way ? Draw a schematic drawing of the Milky Way showing all the components. 1+2+2=5

(d) Describe briefly how a black hole can be formed in Galaxy.

(e) Distinguish between refracting and reflecting telescopes. What are the advantages of reflecting telescope over the refracting telescope ? 3+2=5

(f) How does a supernova explosion lead to the production of a neutron star ?

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

(a) (i) Establish the virial theorem and find the relationship between pressure and gravitational binding energy. 7

(ii) Show that the mass of a white dwarf increases as its radius decreases. 3

(b) (i) Draw the Hubble tuning fork diagram and describe the classification scheme of the galaxies. 7

(ii) Explain why lifetime of a massive star is shorter. 3

(c) (i) What are apparent and absolute magnitudes of a star ? Derive the relation between them. 1+1+4=6

(ii) Explain how the distance of a nearby star can be determined using trigonometric parallax method. 4

(d) (i) Explain how the objects in the solar system are classified. 7

(ii) Distinguish between meteorites and asteriods. 3

(e) How does sun produce energy ? Explain how the process can take place in two different reaction sequences.

1+4+5=10

(f) (i) What are the principal region of solar atmosphere ? Explain their properties. 2+5=7

(ii) What is Kuiper belt ? What is the shape of Kuiper belt ? 2+1=3

(g) Obtain the fundamental equation of cosmology based on Newtonian mechanics and discuss fundamental weakness of this equation. 8+2=10

(h) Write short notes on : ***(any two)*** 5+5=10

(i) Oort Cloud

(ii) SIMBAD

(iii) Active Galaxies

(iv) Big Bang Theory