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 100m radio dish is used for detection of 18cm 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

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