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3 (Sem–6/CBCS) PHY HE 4

2026

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) What is Zenith point ?

   (b) What does *f*-number represent in a telescope ?

   (c) What is the shape of Kuiper belt ?

   (d) What is cosmic microwave background radiation ?

(e) Where does the star formation take place in our galaxy ?

(f) Will solar time and sidereal time differ if the difference in the longitudes of two places is equal to the difference in time ?

(g) Define an asteroid.

(h) What is the most basic property of a star that determines its location on the main sequence ?

(i) Write the sequence of classification of stars.

(j) What is Stellar Parallax ?

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

(a) The apparent magnitude of full Moon is –12·5 and that of Venus is – 4. Which one is brighter and how much ?

(b) State the cosmological principle.

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(c) Write declination δ of

(i) Celestial North pole

(ii) Celestial South pole

(iii) Zenith

(d) Express 1 January, 2023 in Julian Date.

(e) Solar corona is observed only during total solar eclipse. Why ?

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

(a) Explain the concept of distance ladder.

(b) Define luminosity and radiant flux. Using Stefan-Boltzmann law of radiation, obtain the ratio of radii R_1 and R_2 of two stars with surface temperatures T_1 and T_2 and absolute magnitudes M_1 and M_2 respectively. 2+3=5

(c) Explain *one* method used for determination of distance of nearby celestial bodies.

(d) The mass of Sirius B is thrice that of the Sun. Find the ratio of luminosity and difference in their absolute magnitude. Taking the absolute magnitude of the Sun as 5, find the absolute magnitude of Sirius B.

1+2+2=5

(e) Sketch the Sun, and identify the corona, chromosphere, photosphere, convection zone, radiation zone and core. Explain why the temperature of the chromosphere increases with height.

3+2=5

(f) Parallax of Barnard's star is 0.522. Calculate its distance in parsec, light year, astronomical unit, mile and kilometre.

1+1+1+1+1=5

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

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

(i) Carbon-nitrogen cycle

(ii) White dwarf

(iii) Oort's cloud

(iv) Neutron star

(v) Oscillating universe

(b) What is meant by resolving power of a telescope? Explain the Rayleigh criterion for resolution. Calculate the diffraction limit of resolution of a 3*m* telescope for wavelength 600*nm*.

2+5+3=10

(c) Discuss different stages of the evolution of a star.

(d) (i) Discuss various parts of Milky Way, Stellar populations and motions of Stars in the Milky Way.

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(ii) Define active galaxies. Mention the characteristics of active galaxies. 2+3=5

(e) Derive Virial theorem and find the internal energy of a Star. 6+4=10

(f) Explain the terms ecliptic, North and South celestial pole, horizon, celestial equator, latitude, longitude, declination, right ascension and hour angle. Draw a celestial sphere and show the positions of above mentioned terms in the celestial sphere. 5+5=10

(g) What are galaxies ? Explain the origin and evolution of galaxies. How are they classified ? Draw a schematic view of the Hubble galaxy classification. What are the main differences between lenticulars and spirals ?

1+2+1+3+3=10

(h) Sketch the H–R diagram showing all groups of stars. Show the location of the Sun on the diagram. What information does the H–R diagram provide about stars ? 6+1+3=10

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