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S. No. of Question Paper

Unique Paper Code

2224001001

Name of the Paper

Introductory Astronomy

Name of the Course

B.Sc. Hons. - (Physics)_NEP: UGCF-2022

Semester

IV (GE)

Duration: 3 Hours

Maximum Marks: 90

(Write your Roll No on the top immediately on receipt of this paper.)

Attempt five questions in all, including Question No. 1 which is compulsory.

All questions carry equal marks.

1. Answer the following questions:

(6×3=18)

- (a) Difference between Apparent vs. Absolute Magnitude.
- (b) Explain one method to detect exoplanet.
- (c) Difference between Chromosphere and corona.
- (d) Explain Cosmic distance ladder.
- (e) What is the LIGO-India mission? How is it Different from LISA?
- (f) Explain why a sidereal day is shorter than the solar day.
- (g) Assuming Hubble constant to be $70 \text{ Kms}^{-1} \text{ Mpc}^{-1}$, estimate the recession velocity of a galaxy which lies about 10 Mpc away from Earth.

2. (a) An observer in northern hemisphere observes a star in the night sky. Using the concept of the celestial sphere, explain how the observer reports the coordinates of star in horizon and equatorial coordinate system. Explain using appropriate labelled diagrams.

(b) Write differences between the horizon and equatorial coordinate system.

(12+6)

3. (a) Explain diffraction limit in optical telescopes and how it governs resolution. Calculate the diffraction-limited angular resolution of a telescope with a 2 m diameter observing at 500 nm.

(b) List the different types of telescopes used in astronomy. Explain the working principle of any one type of telescope.

(12+6)

4. (a) (i) Define Luminosity of a star. How luminosity can be estimated for a star?

(ii) Calculate the luminosity of a star with radius 7×10^8 m and surface temperature 6000 K.

(b) What role does the Hertzsprung-Russell diagram play in understanding stellar evolution? Draw H-R Diagram.

(12+6)

5. (a) With the help of a schematic diagram, discuss the internal structure of the Sun and explain how energy is transported from the core to the surface.

(b) Describe solar activity, including sunspots, solar flares, and their effects on Earth

(12+6)

6. (a) (i) Draw the rotation curve of the Milky way galaxy. How mass can be estimated using this curve.

(ii) How do rotation curves of galaxies provide evidence for dark matter?

(b) What is the recent advancement of India in space science and exploration?

(12+6)

Some important physical constants:

Mass of Sun $M_{\odot} = 2 \times 10^{30} \text{ kg}$

Radius of Sun $R_{\odot} = 7 \times 10^8 \text{ m}$

Temperature of Sun $T_{\odot} = 5800 \text{ K}$

Luminosity of Sun $L_{\odot} = 4 \times 10^{26} \text{ W}$

Solar Constant $S = 1400 \text{ W/m}^2$

One Light year $1 \text{ Ly} = 9.46 \times 10^{15} \text{ m}$

Boltzmann Constant

$k_B = 1.38 \times 10^{-23} \text{ J/K}$

Wein's Constant

$b = 0.00289 \text{ m K}$

Gravitational Constant

$G = 6.6 \times 10^{-11} \text{ Nm}^2 \text{ Kg}^{-2}$

Hubble Constant

$H_0 = 70 \text{ Km / s / Mpc}$

One Astronomical Unit

$1 \text{ AU} = 1.5 \times 10^{11} \text{ m}$

One parsec

$1 \text{ pc} = 3 \times 10^{16} \text{ m}$