

Sl. of Question Paper : 13560
Unique Paper Code : 2224001001
Name of Paper : **Introductory Astrophysics**
Name of the Course : B.Sc. Hons. Physics_GE Paper (NEP: UGCF-2022)
Name of the Department : Physics
Semester : VII- Semester
Duration: **3 Hours** Maximum Marks: **90**

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
 2. Attempt **five** questions in all including Question No. 1 which is compulsory.
 3. Non-programming scientific calculator is allowed.
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- Q1. Attempt any **five** questions: (3 × 6 = 18)
- (a) Discuss the Horizon coordinate system to locate the position of a star with the help of a relevant diagram.
 - (b) What are the methods to determine the size of an astronomical objects?
 - (c) Define apparent and absolute magnitudes of a stellar object.
 - (d) What are the various features of stellar object which can be known through HR-diagram?
 - (e) What is SETI@Home? Is the project still active?
 - (f) What are the atmospheric layers of the Sun? How temperature varies in different layers?
 - (g) Write the full form and features of GMRT.
- Q2. (a) What are the stellar energy sources? Discuss the various methods to determine the temperature of astronomical objects.
- (b) How we can determine the distance of an astronomical object using parallax method ? Discuss its limitations.
- (c) Derive the distance modulus relation for a star.
- (6+6+6)

- Q3. (a) Define following with an appropriate diagram
 (i) Meridian, (ii) Celestial Sphere, (iii) Celestial equator, (iv) Vertical circle (10)
 (b) Discuss the Universal coordinate system to locate an object on celestial sphere. Discuss its advantages? (8)
- Q4. (a) Define Resolving power and Limiting magnitude. Derive the relation of limiting magnitude of a telescope with primary diameter D with respect to eye. (10)
 (b) Discuss the purpose and features of any two of the following (8)
 (i) James Web telescope (ii) Aladin sky atlas (iii) Fermi Gamma ray space telescope
- Q5. (a) Define tidal force and derive the relation

$$\Delta \vec{F} \sim \frac{GmMR}{r^3} (2 \cos\phi \hat{i} - \sin\phi \hat{j})$$
 (10)
 (b) What are exoplanets? What are the characteristic and various methods to detect exoplanets? (8)
- Q6. (a) Define the differential rotation of the galaxy. Draw approximately the observed rotation curve of the Milky Way and use the same to explain the concept of missing mass. (10)
 (c) Discuss key features of the Indian astronomy mission Aditya and the instruments it carries. (8)

Some important physical constants:

Mass of Sun	$M_{\odot} = 2 \times 10^{30} kg$
Radius of Sun	$R_{\odot} = 7 \times 10^8 m$
Temperature of Sun	$T_{\odot} = 5800 K$
Luminosity of Sun	$L_{\odot} = 4 \times 10^{26} W$
Solar Constant	$S = 1400 m/m^2$
Boltzmann Constant	$K_B = 1.38 \times 10^{-23} J/K$
Gravitational Constant	$G = 6.6 \times 10^{-11} Nm^2 Kg^{-2}$
Hubble Constant	$H_0 = 70 Km / s / Mpc$
One Astronomical Unit	$1AU = 1.5 \times 10^{11} m$
One Light year	$1Ly = 9.46 \times 10^{15} m$
One parsec	$1pc = 3 \times 10^{16} m$