

M.Sc.(Physics) (NEP Pattern) Semester-I
NEP-236-2 / 01MSCPH4.2 - Paper-IV : Astrophysics

P. Pages : 2

Time : Three Hours



GUG/W/23/15138

Max. Marks : 80

Either:

1. a) Explain the concept of the celestial sphere in spherical astronomy. Describe how astronomers use the celestial sphere as a fundamental reference frame for observing celestial objects. Include the concept of the celestial equator and poles in your explanation. **8**
- b) Describe the concepts of hour angle, sidereal time, and mean solar time in astronomy. Explain how these time-related parameters are used in celestial observations and calculations. **8**

OR

- c) Explain the significance of the summer and winter solstices in the context of Earth's axial tilt and its impact on seasons. Discuss how the changing position of the sun during these solstices affects the length of daylight and the seasons on earth. **8**
- d) Discuss different distance measurement units used in astronomy, including astronomical units (AU), parsecs (pc), and standard candles. Explain their respective uses in measuring distances to celestial objects. Provide examples of when each unit is appropriate. **8**

Either:

2. a) Explain the idea of the solar system and its historical development in human understanding. Discuss the key characteristics that define a solar system and the central role of the sun in our solar system. **8**
- b) Describe the study of planets and their satellites (moons) within our solar system. Discuss the major types of planets (terrestrial vs. gas giants) and their unique features. Provide examples of significant moons and their characteristics. **8**

OR

- c) Provide an overview of asteroids, meteors, and comets in our solar system. Explain their origin, composition, and dynamical evolution. Discuss the differences between these celestial objects and their significance in the study of the solar system. **8**
- d) Explain the concept of extrasolar planets (exoplanets) and their detection methods. Discuss the significance of exoplanet discoveries in our understanding of the universe beyond our solar system. **8**

Either:

3. a) Explain the basic optics behind telescopes and how they work to collect and magnify light. Discuss the fundamental components of a telescope and their roles in the optical system. **8**

- b) Describe the various types of telescopes used in astronomy, including refracting telescopes, reflecting telescopes, and compound telescopes. Discuss the advantages and disadvantages of each type and provide real- world examples of telescopes belonging to each category. **8**

OR

- c) Discuss telescope mounting systems, including equatorial mounts and alt-azimuth mounts. Explain their functions and the advantages of using one type of mount over the other in different astronomical observations. **8**
- d) Provide an overview of telescopes designed for various regions of the electromagnetic spectrum, such as infrared, ultraviolet, X-ray, and gamma-ray telescopes. Explain the significance of studying these different wavelengths and how these telescopes differ from optical telescopes. **8**

Either:

4. a) Explain the concept of the sun as a star and how its properties are studied. Discuss the solar spectrum and its significance in understanding the Sun's composition and temperature. **8**
- b) Describe the effective temperature and luminosity of the Sun. Explain how astronomers measure these properties and their implications for the Sun's classification among other stars. **8**

OR

- c) Discuss the photosphere of the Sun, including its characteristics, temperature, and the presence of absorption lines. Explain how the study of absorption lines helps in analyzing the Sun's composition and properties. **8**
- d) Describe the energy source of the Sun, including the Kelvin-Helmholtz time scale and nuclear fusion. Explain how nuclear fusion reactions in the Sun's core generate energy. **8**

5. Attempts all of the following.

- a) Define the concept of the celestial equator and celestial poles. How are they related to Earth's geographic coordinates, and why are they important in spherical astronomy? **4**
- b) Briefly describe the characteristics that distinguish terrestrial planets from gas giants in our solar system. Provide examples of each type of planet. **4**
- c) What are equatorial and alt-azimuth telescope mounting systems? When is each type of mount preferred for astronomical observations, and why? **4**
- d) Explain the concept of absorption lines in the solar spectrum. How do these lines provide insights into the Sun's composition and physical conditions. **4**
