D6BPH2004

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2023

(Regular/Improvement/Supplementary)

PHYSICS

GPHY6B13T: RELATIVISTIC MECHANICS AND ASTROPHYSICS

Time: 2 Hours   Maximum Marks: 60

SECTION A: Answer the following questions. Each carries *two* marks.
(Ceiling 20 Marks)

1. How is luminosity and of a star related to radius?
2. Presence of muons on the earth surface is an evidence for special theory of relativity. Explain.
3. State and explain Hubble's law.
4. What are white dwarf stars?
5. What is a neutronstar?
6. Explain a simple method to find stellar distances.
7. What is the difference between apparent magnitude and absolute magnitude?
8. What is the relation between color and temperature of stars?
9. What is a black hole?
10. Explain Cosmic Microwave Background Radiation.
11. Explain the principle of equivalence.
12. Explain the term Active Galactic Nuclei (AGN).

SECTION B: Answer the following questions. Each carries *five* marks.
(Ceiling 30 Marks)

13. Explain Hertzsprung-Russell diagram.
14. Obtain the Lorentz transformation equations. What is its fundamental difference from Galilean transformation equations?
15. Describe the classification of galaxies.
16. Explain the formation of heavier elements in stars.
17. Suppose a galaxy is moving away from the Earth at a speed 0.8c. It emits radio waves with a wavelength of 0.5m. What wavelength would we detect on the Earth?
18. Derive the relation for addition of velocities in relativistic mechanics.
19. A spaceship moving away from the earth at a speed of 0.8c fires a rocket along its direction of motion at a speed of 0.6c relative to itself. Find the speed of the rocket relative to the earth. Compare the answer with the classical result.

SECTION C: Answer any *one* question. Each carries *ten* marks.

20. Describe the various mechanisms involved in the death of a star.
21. Explain Michelson - Morley experiment and its importance in the development of special theory of relativity.

(1 × 10 = 10 Marks)