

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2026
(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. Give the relationship between luminosity, brightness and distance of a star.
2. State and explain principle of equivalence.
3. Explain relativistic Doppler effect.
4. What is the relevance of Hubble parameter?
5. Why do stars pulsate?
6. What is meant by cosmology?
7. Explain the characteristics of main sequence stars.
8. State Einstein's field equation in general relativity.
9. What is meant by red shift?
10. Differentiate between population I and population II stars.
11. Define parsec. How is it related to light year?
12. What was the prediction of general theory of relativity, regarding the orbit of Mercury around sun?

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

13. Show that the distance between two points is Galilean invariant.
14. Explain the internal structure of sun.
15. Find the velocity at which the mass of a particle is double its rest mass.
16. A spacecraft receding from earth with velocity $0.97c$ transmits data at the rate of 10^4 pulses/sec. At what rate are they received?
17. Consider two stars A and B. Star A appears to be half as bright as B and distance of A is two times that of B. How much is the luminosity of star A compared with respect to star B.
18. Explain the classification binary stars.
19. Two stars alpha Canis Majoris and θ Ceti, have a temperature of 9200K and 1900K respectively. What are their peak wavelengths?

SECTION C: Answer any one question. The question carries ten marks.

20. What is meant by Lorentz length contraction. Prove that a moving rod contracts. What will happen to a square and circle moving with the relativistic speeds?
21. Draw and explain the HR diagram. Explain the life cycle of a star using HR diagram.

(1 × 10 = 10 Marks)