22U610 (Pages: 2) Name : .....

Reg. No : .....

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2025

(CBCSS-UG)

(Regular/Supplementary/Improvement)

CC19U PHY6 B13 / CC20U PHY6 B13 - RELATIVISTIC MECHANICS AND ASTROPHYSICS

(Physics - Core Course)

(2019 Admission onwards)

Time: 2 Hours Maximum: 60 Marks

Credit: 3

Part A (Short answer questions)

Answer ***all*** questions. Each question carries 2 marks.

1. What is the concept of 'universal velocity'?
2. Write the relativistic velocity transformation formula. Briefly explain the importance of the formula.
3. What is meant by Doppler effect? Write the formula for relativistic Doppler effect.
4. Show that massless particle always travels with speed of light using the expression for relativtistic momentum of a particle.
5. What is superior conjunction?
6. How did radiation and matter interact in the early Universe?
7. Define 1 AU. What is the value of 1 AU in parsecs?
8. How is spectroscopy used to find the composition of stars?
9. What is radiation zone of the Sun?
10. How the age of a star cluster can be found?
11. What are cephied variable stars?
12. What is Neutron capture?

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer ***all*** questions. Each question carries 5 marks.

13. Compare between Galilean and Lorentz transformation.
14. Consider two events as observed in S frame which have the spatial coordinate difference,$L = 6 \times 10^4 m$ and time difference between the events is $T = 2 \times 10^{-6} s$. Determine whether the events are timelike or spacelike.

15. A spacecraft receding from the earth at 0.97c transmits data at a rate 1×10^4 pulses/s. At what rate are they received?

16. How can the twin paradox problem be solved?

17. Does the frequency of a photon moving in a gravitational field change? Explain.

18. Sirius is at a distance of 2.63pc and has an apparent magnitude of -1.44 . Calculate its absolute magnitude.

19. Describe how a star is born.

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any ***one*** question. The question carries 10 marks.

20. Explain how red giant stars are formed. Describe the post main sequence evolutionary track of stars with different masses, with the help of an H-R diagram.

21. How does the red shift and Hubble's law are related? Explain the Hubble classification of galaxies.

(1 × 10 = 10 Marks)

****