

20U609

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Name:

Reg.No:

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2023

(CBCSS - UG)

(Regular/Supplementary/Improvement)

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

(Physics - Core Course)

(2019, 2020 Admissions)

Time : 2.00 Hours

Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

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

1. What is the importance of Newton's first law in relativity?
2. The rest length of an object is the largest length it can have in any inertial frame. Justify this statement.
3. Why is the Doppler effect significant in relativistic physics?
4. What is mass-energy equivalence? Can you give any example where mass is converted to energy?
5. State the equivalence principle.
6. What is the connection between energy density of photons in CMBR and Stefan's constant?
7. Write down the relation between between apparent magnitude and absolute magnitude.
8. Do bright things have larger or smaller magnitudes than fainter things? Explain.
9. What is meant by gravitational/hydrostatic equilibrium in a star?
10. What is radiation zone of the Sun?
11. How the age of a star cluster can be found?
12. Explain the rotation of neutron stars.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

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

13. A spacecraft is moving relative to the earth. An observer on the earth finds that, between 2 P.M. and 3 P.M. according to her clock, 3602 S elapse on the spacecraft's clock. What is the spacecraft's speed relative to the earth?
14. A Spacecraft is moving at $0.50c$ with respect to the earth. If another spacecraft is to pass the first one at a relative speed of $0.30c$ in the same direction, what speed must second spacecraft have with respect to the earth?

15. Explain the effect of time dilation in the accuracy of atomic clocks.
16. How is radiation from pulsars used to find an upper limit for photon's mass?
17. Write a note on fusion of carbon and heavier elements. Where does this reactions stop?
18. Explain the stellar parallax method of measuring distances, with the help of diagram.
19. What is a pulsating variable star? What is the main cause of pulsations in pulsating variable stars?

(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)
