



K25U 2942

Reg. No. :

Name :

**III Semester B.Sc. Degree (CBCSS – OBE – Supplementary/Improvement)
Examination, November 2025
(2019 to 2023 Admissions)
CORE COURSE IN PHYSICS
3B03PHY : Mechanics – II**

Time : 3 Hours

Max. Marks : 40

PART – A

Short answer questions. Answer **all**, **each** carries **1** mark. **(6×1=6)**

1. Write down the relation that connects energy and momentum in relativity.
Explain the terms.
2. What are the postulates of special theory of relativity ?
3. Write down the differential equation of a forced harmonic oscillator.
Explain the terms.
4. What is a transverse wave ? Write down an example.
5. What is coriolis force ?
6. Explain length contraction.

PART – B

Short essay. Answer **any 6**, **each** carries **2** marks. **(6×2=12)**

7. Explain the principle of equivalence using the example of a man holding an apple inside the elevator.
8. State and explain law of equal areas.
9. What is a simple harmonic oscillator ? Derive an expression for the angular frequency of a linear harmonic oscillator.
10. Explain the term Q factor, write down the equation and explain the terms.

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11. State Fourier theorem. What are the conditions to apply Fourier theorem ?
12. Explain simultaneity of two events in relativity.
13. What is twin paradox ?
14. Describe the relativistic Doppler effect.

PART – C

Problems. Answer **any 4**, **each** carries **3** marks.

(4×3=12)

15. A small weight of mass M hangs from a string in a car that accelerates at a rate ' a '. What is the static angle of the string from the vertical and what is the tension in the string ?
16. Calculate the total force and fictitious force acting on a body of mass 10 kg relative to a frame moving vertically upwards on earth with an acceleration of 5m/s^2 .
17. Periods of revolution of the planets Earth, Mercury and Mars are 365.26 , 87.97 and 687.05 days respectively. Find the major axis of the orbits of Mercury and Mars in terms of the orbit of the earth.
18. In the laboratory, two particles are appeared to travel in opposite directions with speed $2.8 \times 10^8\text{ m/s}$. Find the relative velocity of one particle with respect to the other.
19. A rod is moving with a velocity 0.6 c with respect to the laboratory. If an observer situated in the laboratory measures its length as 1 m , calculate its proper length.

PART – D

Long Essay. Answer **any 2**, **each** carries **5** marks.

(2×5=10)

20. Explain the universal features of central force motion. How central force motion can be treated as an one body problem ?
 21. Deduce the differential equation of a damped harmonic oscillator. Explain over damped, under damped and critically damped cases.
 22. What are longitudinal waves ? Obtain an expression for the velocity of longitudinal waves in a solid rod.
 23. What do you understand by time dilation ? What is proper time interval ? Explain muon problem to support time dilation in special relativity.
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