Reg. No. : ....

Name : ....

III Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/ Improvement) Examination, November 2023
(2019 to 2022 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. What are noninertial frames ? Give an example.

2. Explain the term resonance.

3. What is Q factor ?

4. State the principle of superposition.

5. What is mass energy relation in relativity ? Explain.

6. What are Einstein's postulates ?

PART – B

Short essay. Answer **any 6, each** carries **2** marks.

(6×2=12)

7. What is fictitious force ? Derive the expression for fictitious force in uniformly accelerating system.

8. With the help of proper diagram, obtain Galilean transformation equations for coordinate, velocity and acceleration.

9. Explain the properties of central force motion.

10. Write down the differential equation of a damped harmonic oscillator. Explain the conditions for different types of damping.

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11. Obtain the general equation of plane progressive wave.

12. Explain Doppler effect.

13. Explain simultaneity and clock synchronization in relativity.

14. Write down velocity transformation equations from Lorentz transformation.

PART – C

Problems, Answer **any 4**, **each** carries **3** marks.   (4×3=12)

15. The angular velocity of a rotating rigid body about an axis is $\omega = 4i + j - 2k$. Find the linear velocity of a point p on the body whose position vector relative to a point on the axis of rotation is $2i - 3j + k$.

16. The mean diameter of moon's orbit around the earth is 7.6×10^5 km and orbital period is 27 days. Using these data calculate the period of revolution of an artificial satellite in an orbit of radius 10^4 km around the earth.

17. Consider a tuning fork of frequency 440 Hz. A sound level meter indicates that the sound intensity of the fork decreases by a factor of 5 in 4 seconds. What is the Q factor of the tuning fork ?

18. What is time average of a function ? Calculate the time average of $\sin^2\theta$ over a complete period.

19. Two electrons each with velocity 0.8c move towards each other. Find the relative velocity of one electron with respect to the other.

20. The length of a rod is 10 m in a frame S. What is it's length in another frame S′ that moves with a velocity 0.8c relative to S ?

PART – D

Long essay. Answer **any 2**, **each** carries **5** marks.   (2×5=10)

21. Define scattering angle and impact parameter. Explain the trajectory of a charged particle scattering off an atomic nucleus with proper diagram.

22. What are transverse waves ? Obtain an expression for the velocity of transverse waves moving along a stretched string.

23. Write an essay about length contraction, time dilation and twin paradox.

24. Obtain the Lorentz transformation equations.

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