K24U 3442

Reg. No. : ....

Name : ....

III Semester B.Sc. Degree (C.B.C.S.S. – O.B.E.-Regular/Supplementary/Improvement) Examination, November 2024
(2019 to 2023 Admissions)
CORE COURSE IN PHYSICS
3B03PHY : Mechanics – II

Time : 3 Hours

Max. Marks : 40

PART – A

Short answer question. Answer **all** questions. **Each** carries **one** mark.

1. Which is the Galilean invariant quantity in the transformation equations ?

2. What is principle of equivalence ?

3. List any two properties of central force motion.

4. Write the differential equation for a damped harmonic oscillator.

5. When two waves interfere, does one alter the progress of other ?

6. State the postulates of special theory of relativity. **(6×1=6)**

PART – B

Short essay questions. Answer **any six** questions. **Each** carries **two** marks.

7. How does the Coriolis force affect weather patterns ?

8. Draw the Energy diagram of a two non-interacting particles.

9. Write down the differential equations for the following harmonic oscillators.
   a) Mass on a spring   b) Simple pendulum

10. What is meant by Quality factor of an oscillator ? How is it affected by damping ?

11. State Fourier's theorem. What are the conditions of its applicability ?

12. Explain the difference between phase velocity and group velocity.

13. What is the importance of the negative results of Michelson-Morley experiment ?

14. What is meant by length contraction and time dilation ? **(6×2=12)**

PART – C

Problems. Answer **any four** questions. **Each** carries **three** marks.

15. A bead slides without friction on a rigid wire rotating at constant angular speed ω. Find the force exerted by the wire on the bead.

16. A satellite moves in a circular orbit round the earth at a height $R_e/2$ from earth's surface where R_e is the radius of the earth. Calculate its period of revolution ($R_e = 6.38 \times 10^6$ m).

17. What is the potential energy of a mass of 1 kg on the surface of the earth, refereed to zero potential energy at infinite distance ? Calculate also its potential energy at a distance of 10^5 km from the centre of the earth.

18. Two wires of the same material and the same cross section are suspended on a sonometer. One is loaded with 16 kg and the other with 4 kg. The first wire is tuned to second harmonic of the second wire. If the second wire is 1 m in length, what is the length of the first wire ?

19. Compute the speed of a rocket whose clock run one second lower per hour relative to a clock on earth.

20. The spectral line of $\lambda = 5000$Å. In the light coming from a distant star is observed at 5200Å. Find the recessional velocity of the star. What is the distance of the galaxy ? **(4×3=12)**

PART – D

Long essay. Answer **any two** questions. **Each** carries **five** marks.

21. State Kepler's laws of planetary motion. Derive the law of periods.

22. Set up differential equations of a simple harmonic motion and obtain its two possible solutions. Also comment on the velocity and acceleration of the system at extreme and equilibrium positions.

23. Derive an expression for the velocity of transverse waves in a stretched string.

24. Derive an expression for the kinetic energy of a relativistic particle. Hence deduce mass-energy relation. **(2×5=10)**

_____