0069072 **K19U 2268**

Reg.No. : .....

Name : .....

V Semester B.Sc. Degree (CBCSS- Reg./Sup./Imp.) Examination, November-2019

(2014 Admn. Onwards)

Core Course in Physics

5B 08 PHY: CLASSICAL MECHANICS AND RELATIVITY

Time : 3 hrs Max. Marks : 40

SECTION - A

(Very short answer type - Each carries **1** mark - Answer all **4** questions.) **(4×1=4)**

1. The four dimensional space is known as ----------
2. If no external forces act on a system of particles, its linear momentum ---------- ----------
3. Momentum of a particle of velocity v and relativistic energy E is given by p= ----------
4. When a particle moves under the action of central force its angular momentum is ----------

SECTION - B

(Short answer type - Each carries **2** marks - Answer **7** questions out of 10) **(7×2=14)**

5. State the postulates of Special Theory of Relativity.
6. Differentiate Holonomic and non holonomic constraints.
7. Obtain the expression for escape velocity of an object from earth.
8. What do you mean by centre of mass? Comment on its velocity.

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9. Write a note on variation of mass with velocity.
10. What are central forces? Give examples.
11. What is Lorentz Fitzgerald contraction?
12. Explain Twin paradox.
13. What do you mean by equipotential surfaces?
14. Write down the expressions for gravitational potential due to thin spherical shell (at points inside and outside of the shell).

SECTION - C

(Short essay/problem type - Each carries **3** marks - Answer **4** questions out of 6). **(4×3=12)**

15. Derive the Equation $E^2 = P^2c^2 + m_0^2c^2$
16. Find out the total energy of a particle in central Force field
17. Explain the consequences of Lorentz transformations
18. An electron moves about a proton in circular orbit of radius 0.5 A^0. Calculate the orbital angular momentum of electron about proton.
19. In the laboratory the life time of a particle moving with speed 2.8×10^8 m/sec, is found to be 2.5×10^{-7} sec. Calculate the proper life time of the particle.
20. Generate the Lagranges equation for a simple pendulum.

SECTION - D

(Long essay type - Each carries **5** marks - Answer **2** questions out of 4.) **(2×5=10)**

21. Obtain Lagranges equations of motion from D'Alembert's principle.
22. State and prove Kepler's laws of planetary motion.

23. Obtain the expressions for Gravitational field and potentials due to a thin spherical shell. (Both inside and outside) show the variation of potential with distance graphically.

24. On the basis of Lorentz transformation equations, discuss the following kinematics 1) Length Contraction 2) Time dilation