



K18U 1488

Reg. No.:

Name :

**V Semester B.Sc. Degree (CBCSS – Reg./Sup./Imp.)
Examination, November 2018
(2014 Admn. Onwards)
CORE COURSE IN PHYSICS
5B 08 PHY : Classical Mechanics and Relativity**

Time : 3 Hours

Max. Marks : 40

SECTION – A

(Very short answer type – Each carries 1 mark – Answer all 4 questions)

1. When a particle moves under the action of central force its angular momentum is _____
2. If no external forces act on a system of particles, its linear momentum _____
3. Velocity of light is _____ in all possible inertial frames of reference.
4. Momentum of a particle of velocity v and relativistic energy E is given by $p =$ _____
(4×1=4)

SECTION – B

(Short answer type – Each carries 2 marks – Answer 7 questions out of 10)

5. State the postulates of Special Theory of Relativity.
6. State D' Alembert's Principle and explain the concept of virtual work.
7. What are central forces ? Give examples.
8. What do you mean by the terms Gravitational field and Gravitational potential ?
9. What is Centre of mass ? Find out the expression of position vector of Centre of mass of a system of particles.
10. Explain Twin Paradox.
11. State Kepler's Laws of Motion.

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12. Deduce the expression for momentum of a particle with velocity v and relativistic energy E .
13. State the postulates of Special Theory of Relativity.
14. What do you mean by an inertial frame of reference? (7×2=14)

SECTION – C

(Short essay/problem type – Each carries 3 marks – Answer 4 questions out of 6)

15. 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.
16. Find the momentum of an electron which is accelerated by a potential difference of 20 volts.
17. Show that escape velocity of a body from solar system, launched from the earth is $\sqrt{2GM/R}$. (where M = mass of sun R = distance of earth from sun).
18. Generate the Lagranges equation for a simple pendulum.
19. What are the consequences of Lorentz transformation?
20. Give 2 examples for mass energy relation. Explain it briefly. (4×3=12)

SECTION – D

(Long essay type – Each carries 5 marks – Answer 2 questions out of 4)

21. Comment on the motion of a particle under central force. What remains conserved there, Explain. What do you understand by spin and orbital angular momentum?
22. Deduce the expressions for gravitational potential and field due to a solid sphere at various points and represent the potential variation with distance graphically.
23. State and prove Kepler's laws of planetary motion.
24. Derive an expression for kinetic energy of a relativistic particle. Hence deduce the Einstein's mass energy relation and write a note on it. (2×5=10)