KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2017



Level : B. Sc.
Year : III
Time : 2 hrs. 30 mins.

Course : PHYS 312
Semester : II
F. M. : 55

SECTION "B"
[5Q. × 4 = 20 marks]

1. Derive relativistic formulation of equation of motion and also express the classical limit of such equation of motion.

OR

Write a short note on relativistic classification of particles.

2. Deduce an expression for transformation of momentum and energy.

3. Obtain Hamilton's equations from modified Hamilton'sprinciple.

4. Describe the Galilean transformations of velocity and acceleration of a particle.

5. Establish the relation between energy and momentum in relativistic mechanics.

OR

Develop the expression for Lorentz transformation of force.

SECTION "C"
[5Q. × 7 = 35 marks]

6. Express modified Hamilton's principle. Derive an expression of Hamilton's canonical equations in covariant form.

OR

Obtain the Hamilton's principle in relativity. Derive an expression for relativistic Lagrange's equation.

7. What do you mean by four vectors? Express scalar and vector product of two world vectors, gradient, divergence and curl of four vectors. Obtain the conditions and differences for space like and time like of four vectors.

OR

Describe in details about space like and time like intervals in Minkowski space with necessary diagrams.

8. a. At what speed will the mass of a body be twice its rest mass? Evaluate the speed of a particle when its kinetic energy is equals its rest energy.
   b. Calculate the mass of a particle whose kinetic energy is half its total energy. How fast is it travelling? What is the speed and momentum of an electron whose kinetic energy equals its rest energy?

9. Show that $m = m_0\gamma$ and $E = mc^2$ and discuss the equivalence of mass and energy.

10. Describe the phenomenon of aberration? Derive the formulae for aberration by using Lorentz transformation equations. Compare it with the classical formula.