

PHYS3007 Exam Report 2013/14

The answers this year were of a very high standard and I was very impressed by the performance across the full paper. Students had got to grips with the Lagrangian formalism and four vector notation very well.

Section A

A1 - Well done by almost all the students. They have properly applied the Euler-Lagrange formula for the equations of motion. They have recognized the constants of motion pointing out the independence of the Lagrangian from the x and time coordinates.

A2 - Most of the students properly applied the Lorentz transformation and found the right relationship for the relativistic Doppler effect.

A3 - Generally well done; the students wrote the right formula for the proper time and they found the correct relation between the three components of the classical velocity and the four components of the relativistic velocity.

A4 - In this question I have noticed some common mistakes: many students have not taken the right elements from the Electromagnetic strength field leading to a different overall sign, which was often compensated by not applying the metric tensor in order to have the right components of u_{ν}

A5 - Usually well answered, in spite of some inconsistencies when defining the D'Alembert operator.

Section B

B1 a,b,c were generally well answered. In d the position of the centre of mass of the string should be used for its weight. Some students struggled to put in the initial conditions in the final part.

B2 Mostly students started these sections well and showed a good understanding of four vectors, Lorentz boosts and the invariant mass – the typical error was just to become lost in the algebra.

B3 a and b were very impressively answered by most of the class – these are usually questions that the cohort ignore but this year everyone had knuckled down and learnt this stuff well. The final part was answered fine by those that remembered the Lorenz gauge condition.

B4 was only answered by a handful of people and so there were no particular patterns to answers. a, b and c were bookwork and d a generalization of the problem on the square well done in lectures.