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# A-LEVEL MATHEMATICS

MM05 Mechanics 5  
Report on the Examination

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6360  
June 2016

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Version: 1.0

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## General

The students generally showed high levels of proficiency when solving differential equations and dealing with the associated topics. This year, the students found some aspects of the work on SHM and energy more difficult to deal with, possibly because the questions were less familiar in nature.

### Question 1

Part (a) was generally done well. Part (b) caused more difficulties for the students. There were two common errors. The first was to use  $\frac{\pi}{40}$  instead of  $-\frac{\pi}{40}$  when trying to find the time, and the second was to try to find a fraction of the period; often  $\frac{3}{4}$  was used.

### Question 2

Part (a) was often done well, but some students got confused when finding the extensions of the strings. When finding the acceleration, some students did well, but some made errors with the signs and extensions that introduced errors into their working. Where students were not able to make a good attempt at the acceleration, they found it difficult to produce reasonable attempts at the last two parts of the question. Generally, students found it easier to find the period than the maximum speed. A few students did a lot of work to find the maximum speed.

### Question 3

Part (a) was done quite well. Those students who found a correct expression for the extension of the string generally did well and obtained a correct expression. A few students did not account for the fact that there were two strings. In part (b), many students found a correct derivative but did not know how to show that this must be equal to zero at some point between 0.7 and 0.8. Often students tried to solve an equation or used a value of  $\theta$  like 0.75. In part (c), very few students used the fact that the derivative had changed from negative to positive. Often seen were second derivatives and substitution of values like 0.75. Overall, students found the slightly different approach in the second two parts of this question difficult to work with.

### Question 4

Some students did very well with this question, but they were very much in the minority. In part (a), the most common issue was for students to try to use Newton's second law rather than the information that there was no transverse component to the force and hence no transverse acceleration. This error sometimes made it very difficult for students to make much progress with the rest of the question. In part (b), of those students who took the correct approach, several did not introduce a negative sign to account for the fact that the force was directed towards the origin. Those who were successful with part (b) often went on to do well in part (c), but the majority of students made very little progress with this part.

### Question 5

This question was very well done. Students generally found it to be accessible and many scored highly. The main reason that marks were lost was minor errors in working.

**Question 6**

Most students did very well on this question. A few had difficulties with part (a), but then were able to use the given differential equation to recover. The standard of integration was very good, and the unknown constant was usually found without difficulty. In part (c), some students worked much harder than was necessary to find the mass. In some cases, students did not realise that they could use their answer to part (b).

**Mark Ranges and Award of Grades**

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