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Examiners' Report/
Principal Examiner Feedback

Summer 2013

GCE Mechanics M4 (6680)
Paper 01R

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Mechanics M4 (6680R)

Introduction

Many candidates found this paper straight forward in comparison with some recent papers. Some candidates did not attempt all the topics, but in general the quality of the work was good. As ever, the best work was usually accompanied by clearly labelled diagrams and was logically presented.

In calculations the numerical value of g which should be used is 9.8, as advised on the front of the question paper. Final answers should then be given to 2 (or 3) significant figures – more accurate answers will be penalised, including fractions.

In all cases, as stated on the front of the question paper, candidates should show sufficient working to make their methods clear to the Examiner. If there is a printed answer to show then candidates need to ensure that they show sufficient detail in their working to warrant being awarded all of the marks available. Candidates who cannot reach a given answer should be advised to look for their error rather than adapt work which might well have been correct – they often lose more marks than they gain through this tactic.

If a candidate runs out of space in which to give their answer than they are advised to use a supplementary sheet – if a centre is reluctant to supply extra paper then it is crucial for the candidate to say whereabouts in the script the extra working is going to be done.

Report on Individual Questions

Question 1

In part (a) almost all candidates found the relative velocity correctly and went on to find the magnitude.

Part (b) of the question proved to be a little more testing. Most candidates had some indication on a diagram of the correct direction for the relative velocity but they could not always translate this into a bearing.

Question 2

Many fully correct solutions were seen. When things did go wrong it was usually because the candidate applied conservation of linear momentum perpendicular to the plane and the impact law parallel to the plane.

Question 3

No diagram was given with this question, which might have contributed to the confusion for some candidates over the direction of motion of B after the impact. Several fully correct solutions were seen, but not all candidates understood that they needed to consider the motion parallel to the line of centres.

Question 4

This was a relatively straight forward question on relative velocity, but some candidates offered no solution.

In part (a) most candidates recognised the need to form a right angled triangle, but they did not all put their right angle in the correct place.
In part (b) the distance triangle was usually correct, and the only difficulties here were due to confusion between sine and cosine.

In part (c) candidates who started by calculating the relative velocity usually completed the question correctly, but the trig confusion in part (b) usually carried over to affect this part as well.

Question 5

In part (a) most candidates were able to use the information about the rate of work of the van's engine to form the equation of motion correctly, but the given answer did lead to some attempts to try to fudge the answer.

In part (b) there was some weak integration, but the majority of candidates were able to separate the variables and achieve a correct equation for t in terms of v. There were a few slips in rearranging this to find v in terms of t.

Question 6

In part (a) some candidates did not attempt this part of the question at all. For those who did, the two challenges were to find a correct expression for the extension in the string so that they could calculate the elastic potential energy and then to use trigonometric formulae to rearrange their expression for the potential in terms of $\sin\theta$. Some candidates achieved this more easily than others.

In part (b) almost all candidates understood the method of differentiating the expression for potential energy and looking for a turning point. Only a minority used this information to obtain an expression for $\sin\theta$ and went on to use the information about θ to give a convincing explanation of the given conclusion.
In part (c) the work to find the second derivative was often correct, but the work to reach the given conclusion was not always clear.

Question 7

This proved to be the most challenging question on the paper.

In part (a) several candidates did not attempt this part of the question, but most of those who did were able to find the extension in the spring with *P* hanging at rest and, with the aid of a clearly labelled diagram, went on to deduce the given result.

In part (b) several candidates did not realise that they needed to start with the equation of motion for *P* and then use their information from (a) to deduce the given differential equation. There were several fudged attempts to convert equations involving $\frac{\mathrm{d}^2x}{\mathrm{d}t^2}$ to obtain $\frac{\mathrm{d}^2y}{\mathrm{d}t^2}$.

For part (c) most candidates obtained the correct general solution for the differential equation, although some did more work than necessary by finding or checking the particular integral for themselves. The evaluation of the constants was usually correct.

In part (d) many candidates had a correct expression for $\frac{\mathrm{d}y}{\mathrm{d}t}$ but they were not all successful in finding the value when $t = \frac{1}{3}\pi$.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:
http://www.edexcel.com/iwant to/Pages/grade-boundaries.aspx

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