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General Certificate of Education

Mathematics 6360

MM2A Mechanics 2A

Report on the Examination

2007 examination - June series

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General

The paper proved accessible to the majority of candidates who were able to attempt all the questions within the time allowed. Presentation was good with mostly accurate working. A significant number of the candidates were well prepared for this paper, achieving marks over fifty out of a possible sixty.

A considerable amount of 'creative' algebra was seen when the answer was given, particularly in questions 5 part (a) and 6 part (b).

Question 1

Many candidates were handicapped by the lack of a clear labelled diagram and so their moment equations were often incorrect. A few candidates forgot to include the g terms.

Question 2

Nearly all candidates quickly found the power to be $87\,500$ watts. In part (b), most found the resistance force to be 1050 N but only the better candidates realised that the force exerted by the engine had changed because the speed had changed.

Question 3

Most candidates completed this question successfully. A few used $\mathbf{v} = \mathbf{u} + \mathbf{a}t$ in part (b) and obtained $\mathbf{v} = (6 + 3t)\,\mathbf{i} + (30 - 6t^2)\,\mathbf{j}$, rather than the given answer. After they had done the integration of $\mathbf{a}$, a number of candidates 'invented' the $6\mathbf{i} + 30\mathbf{j}$ terms required.

Question 4

In part (a), many candidates used conservation of energy, not to find the kinetic energy when the string became taut, but to find the velocity when the string became taut. Then they used $\text{KE} = \frac{1}{2}mv^2$ to find the kinetic energy when the string became taut. The simpler method of using conservation of energy with gain in kinetic energy equalling the loss in potential energy was rarely seen; this of course immediately gave the required kinetic energy. In part (b), most candidates used the change in potential energy to be the change in EPE and readily found λ.

Question 5

Many candidates completed part (a) well. A number did not use conservation of energy whilst many used $\frac{1}{2}m(7v)^2$ to be $\frac{7}{2}mv^2$; regardless of these errors it was common for such candidates to arrive at the printed result $v = \sqrt{\frac{ag}{12}}$. In part (b), the required components, R, mg and $\frac{mv^2}{r}$, appeared frequently in the equation but often not with the appropriate signs.

Question 6

A significant number of candidates created $\frac{\mathrm{d}v}{\mathrm{d}t} = -\lambda v$ without proper justification. The equation $-\lambda mv = ma$ was a necessary step which needed to be seen. Even more knew roughly how to obtain $v = U\mathrm{e}^{-\lambda t}$, but too often algebraic skills were not sufficient and $\ln v = -\lambda t + \ln u$ regularly became $v = \mathrm{e}^{-\lambda t} + U$, before becoming $v = U\mathrm{e}^{-\lambda t}$. This and similar errors were not condoned.

Question 7

In part (a), candidates were asked to **explain** why $T = 49\text{N}$. Many candidates simply showed that $5g = 49$. The fact that particle Q was in equilibrium, or at least was not moving, needed to be stated. Most candidates answered parts (b) and (c) correctly, but there were some instances where three forces appeared in the resolving equations in either or both of these parts.

Coursework Component

There was still a tendency to make transcription and addition errors when totalling the scripts. The final marks should be carefully checked prior to submission to AQA and for moderation. A number of scripts had either no marking on them or were marked in pencil. Scripts should be marked in red pen and calculations should be checked for accuracy (and indicated as such on the scripts). All Candidate Record Forms must be signed by the candidate and the teacher responsible for the assessment of the script.

There were only scripts submitted from a small number of centres in this session. There were some excellent scripts seen across the tasks. The 'roller coasters' task it still the most popular task seen. In this task, candidates should be encouraged to relate the theoretical results to real-life examples of roller coasters; this information is readily available on the internet. It is expected that the theory will be clearly derived; there should be no assumption that the reader of the coursework knows the answer already.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.