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General Certificate of Education

Mathematics 6360

MM2A Mechanics 2A

Report on the Examination

2008 examination - June series

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Written Component

General

There was a very small entry for this unit in this the last series in which it will be available. The early questions proved to be a pleasing introduction to the paper, as candidates found questions 1–3 and question 5 straightforward, and answered them well. The other questions were often found to be challenging.

Sign errors were common, as in questions 3 part (b) and 7 part (b)(iii).

Question 1

This question was answered well.

Question 2

Again, candidates answered this question well.

Question 3

Part (a) of this question was answered well.

In part (b), mistakes often arose when $T = \frac{mv^2}{a} + mg$ became $T = \frac{mv^2}{a} - mg$.

Question 4

This question was badly answered. Many could not differentiate $\sin\frac{1}{4}t$ correctly, with $\cos\frac{1}{4}t$, $\cos\frac{1}{4}$ and $\frac{1}{4}t\cos\frac{1}{4}t$ all being seen regularly. Many of those who did find $\mathbf{v}$ correctly struggled to prove that $|\mathbf{v}|$ was a constant: they knew that $\sin^2\theta + \cos^2\theta = 1$, but often $(2\sin\frac{1}{4}t)^2 + (2\cos\frac{1}{4}t)^2$ became $4 + 4 = 8$.

Many dubious attempts were made to prove that the particle was moving in a circle. Only a few used the simple method: $r = 8$. In part (d), $v = \omega r$ and $v = \frac{\omega^2}{r}$ were used in equal measure. Candidates who used $v = \frac{\omega^2}{r}$ were misquoting the formula $a = \frac{\omega^2}{r}$. Often the values of r and v which candidates substituted were in vector form, with random attempts made at the division of two vectors.

Question 5

Parts (a), (b) and (c) were answered well. In part (d), few candidates used the fact that the work done by the force was equal to the change in kinetic energy. Most used complicated methods which rarely gave an appropriate answer.

Question 6

In general, part (a) was answered well, but again a number of candidates spuriously concocted an answer: if they had obtained 80 000, a factor of $\frac{5}{4}$ was clearly needed to give the printed result.

In part (b), instead of using $100\,000 \div 25$, some candidates assumed that the force exerted by the engine was still 2000 N; the speed also meant that the resistance to motion had changed to 1000 N and therefore the accelerating force was $4000 - 1000$ N.

A significant proportion of candidates found the required quadratic equation and solved it very well in part (c). Some used $mg \cos 6$ instead of $mg \sin 6$.

Question 7

Part (a) tested work done $= \int F \, dx$. Few candidates found $\int_0^e \frac{\lambda x}{l} dx$ correctly. Instead of integrating, a few candidates used the value of the integral to be the area under the line $y = \frac{\lambda x}{l}$. Unfortunately, many candidates used techniques which were not credited: for example, elastic potential energy is $\frac{\lambda x^2}{2l}$ and $x = e$; or work done = maximum force × half the distance moved, without a clear justification.

Part (b)(i) and (ii) were completed well. In part (b)(iii), most candidates attempted to conserve kinetic energy, potential energy and elastic potential energy, but often the signs of the three terms in the equation $\frac{1}{2} mv^2 - 245 + 10g = 0$ were incorrect.

Coursework Component

There were too few scripts submitted in this series to enable any meaningful feedback to be given.

Mark Ranges and Award of Grades

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