A-LEVEL

Mathematics

MM2B – Mechanics 2B

Report on the Examination

6360
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General

The early questions proved to be a pleasing introduction to the paper with most students achieving good marks. Questions 7 and 8, together with question 6 part (c), were found to be more demanding and these were designed to discriminate students at the higher range of the ability spectrum

Question 1

Parts (a) and (b) were usually answered correctly but in part (c)(i), a number of students subtracted the two energies rather than adding them. Part (c)(ii) was usually completed correctly.

Question 2

Most students showed that they knew the techniques involved in solving this question which was answered well. In part (b) the majority of students integrated to find the velocity vector but some forget the $+ c$ term and thus ignored the initial velocity vector. Some found the $+c$ incorrectly assuming that $\boldsymbol{c}$ was $-7\mathbf{i} - 4\mathbf{j}$ without completing the necessary calculation.

In part (c) a number of students did not handle the negative components correctly with the **j** component frequently becoming $-4 + 0.03125$ rather than $-4 - 0.03125$.

Question 3

This question was also usually answered well. However a significant proportion of students forgot to include the lamina in their system and only found the centre of mass of the four particles.

Question 4

Most students correctly found the angular speed in radians per second in part (a). Students also showed that they appreciated that in parts (b) and (c) they needed to resolve horizontally and vertically. However in part (b) in the equation $T\cos 35 = mg$, a number used $\sin 35$ and others placed the $\cos 35$ term on the wrong side of the equation.

There were similar errors shown in part (c).

Question 5

In part (a) most students realised that they needed to consider the kinetic energy at the lowest point together with the change in potential energy moving from the point P to the point Q.

A number of students could not find the kinetic energy at the point P as they were unable to find the square of $7\sqrt{ag}$. Another common error was in using a for the vertical difference in height between P and Q rather than $2a$.

In part (b), many students correctly found the three terms required in the relevant equation $T + mg = \frac{mv^2}{a}$ but, unfortunately had the sign incorrect.

Question 6

Having lost the required minus sign in part (a), some students started with $m\frac{\mathrm{d}v}{\mathrm{d}t} = 0.3mv^{\frac{1}{3}}$ but found that this did not give the printed result. They then just inserted a minus sign near the end of their working. This was not accepted. However most students were successful in this part.

In part (b) students were expected to state that $4(-0.2t)^{\frac{3}{2}} = 0$ implies that $4 - 0.2\,t = 0$. Some tried to expand $(4-0.2t)^{\frac{3}{2}}$ as $8-0.2t^{\frac{3}{2}}$ and then equated this to zero. This was also not accepted.

In part (c) a significant number of students tried to use the equations for constant acceleration. Others tried to integrate $(4-0.2t)^{\frac{3}{2}}$; many found the integral to be $k(4-0.2t)^{\frac{5}{2}}$ but did not obtain the correct value for k. The final common error was inserting the values for v in the final equation [8 and 0] rather than the values for t [0 and 20].

Question 7

Many students did not indicate that the force acting on the ladder at point C was perpendicular to the ladder but instead made the force at *C* act horizontally**.**

Students appreciated that a moment's equation was required and usually they sensibly chose this to be about point A but many were unable to obtain this equation correctly, either forgetting to include the lengths or the angles.

Question 8

Part (a) was answered well by most students.

In part (b) (i) students needed to consider gravitational potential energy, work done and elastic potential energy at both points B and C. Unfortunately many omitted one of these terms. In part (b)(ii), many students did not include the tension in the forces acting on the particle and many others did not find the value of the tension correctly.

Mark Ranges and Award of Grades

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

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator www.aqa.org.uk/umsconversion