GCE

Examiners' Reports

AEA
Advanced Extension Awards 9801

June 2004

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Advanced Extension Award Unit AEA
Specification 9801

(Maximum mark: 100)
(Mean mark: 35.2: Standard deviation: 22.4)

Introduction

It was pleasing to see the quality of the work presented by the better candidates - there were some very impressive scripts and many elegant solutions at the top end - but it was also disappointing to see so many candidates who clearly were unprepared for the challenge. Although the length of the paper, the lack of calculating aids and the unusual nature of some of the questions posed some problems, some of the errors made, particularly algebraic, suggested that we were not always seeing good AS/AL candidates. For candidates making a serious attempt at the paper, Q2, Q3 and Q6, particularly the latter, were often a good source of marks, although full solutions were not too common; Q2(d) proved more obscure than expected and often heavy weather was made of Q3. Q4 and Q7 proved more of a problem and it was only the good candidates who saw a route through these questions, with elegant solutions few and far between.

Report on individual questions

Question 1

Although good candidates often scored 7 of the 9 marks, some of the errors seen in this question were very disappointing at this level. A sample are:

(i) squaring $\cos x + \sqrt{1 - \frac{1}{2}\sin 2x} = 0$ to give $\cos^2 x + \left(1 - \frac{1}{2}\sin 2x\right) = 0$;

(ii) stating that $\cos x(\cos x + \sin x) = 1 \Rightarrow \cos x = 1 \textit{ or } \cos x + \sin x = 1$;

(iii) reaching a correct stage $\sin^2 x = \sin x \cos x$ and cancelling sin*x*.

Checking of spurious answers due to squaring was very rare, so full marks for this question were usually only gained by the best students.

Question 2

The first two marks were usually gained. In part (b) the marks were often gained, too, but it was quite common to see $\sum_1^\infty n x^n = \sum_1^\infty (n+1)x^n - \sum_1^\infty x^n = \frac{1}{(1-x)^2} - \frac{1}{1-x}$, which although correct, omitted the step, $\left\{\frac{1}{(1-x)^2} - 1\right\} - \left\{\frac{1}{(1-x)} - 1\right\}$.

In part (c) there were some good proofs, but many fudges were seen and often the strategy was not sound.

Correct answers to part (d) were not common; it was surprising how few candidates related part (d) to part (c) and even where they did, choosing $x = \frac{1}{8}$ was relatively rare.

Question 3

Full, well-argued and neat solutions were seen but that was not the norm; there was considerable confused thinking, with the majority of candidates finding this more difficult than was expected.
Part (a) was an easy starter, although statements like $8 - 2k + 8 + 2k = 0$ were not overlooked. In part (b) many candidates obtained $(x-2)(x^2+2x-k)$ but then only considered repeated roots from the quadratic factor and just found the one value of k,
$k = -1$. Despite part (b) asking for **values** of k, and the stem to part (c) starting with "Given that $k > 0$……" , most of these candidates carried on, showing very little appreciation of the demands of the question. Some candidates kept k in their solution throughout.

Question 4

There were many ways of solving this problem and we saw a wide range of "solutions", from very impressive, neat solutions completed in half a page to those taking up to nine pages. Generally those candidates who considered the geometry/trigonometry of the situation came up with the quickest solutions, but often not recognising that the coordinates of the centre of the circle were $(r, 4)$ was a major stumbling block. Many candidates worked with equations with too many unknowns, and some candidates, having made arithmetic or algebraic mistakes had quadratic equations that were not easy to solve without a calculator. Part (b) was rarely completed successfully, and then by only the best candidates.

Question 5

Few candidates gained all 15 marks, but many were able to pick up marks across the four parts. In part (a) many candidates scored 2 of the marks but the manipulation required to simplify the result to the given form often proved too difficult and fudges were frequent.
Although a large number of candidates pointed to apparent algebraic errors in the given proof, many did identify the error correctly, even if an accompanying reason sometimes
was questionable. The better candidates, with good calculus skills, usually produced a substantially correct version, although some errors were seen in trying to simplify expressions.
Many candidates picked up marks in part (c), but not those who showed that differentiating each side with respect to t gave the same result. Only a very small group of candidates gained all 3 marks in part (d).

Question 6

Despite the novelty element in this question, it was the best answered question with even the weak candidates able to gain marks; often candidates whose total was in the 25-30 range picked up more than one third of their marks here. The sketches were generally well done, but part (b) was not answered well by many candidates. Candidates who worked with the area of the relevant triangle were more successful than those who integrated. Few candidates realised that between 2 and p the function was $x - 2$ and often gave $\int_2^p \mathrm{f}(x)\,\mathrm{d}x$ as $\left[\frac{x^2}{2} - \frac{[x]^2}{2}\right]_2^p$ and were not able to recover. Candidates who reached the stage $p^2 - 4p + 3.64 = 0$ were often not able, without a calculator, to solve the quadratic. Parts (d) and (e) often proved a good source of marks, even though at times candidates who did not deal with $[x]$ initially seemed only to realise that it was equal to n by comparing their equation with the printed equation. Solutions to part (f) were variable but generally only tackled by the better candidates.

Question 7

Although some candidates did not manage to get to grips with the question through lack of time it was disappointing that so few of the first ten marks were gained by many of the candidature. In part (a) sometimes the right angle was not appreciated so one equation was lost, and so many were hindered by writing $b^2 = a^2 + d,\ c^2 = b^2 + d$ rather than combining them as $2b^2 = a^2 + c^2$.
In part (b) not realising that cot C = 0 was often the stumbling block, but there were some good answers to this part. Headway in parts (d) and (e) was only made by the better candidates, some of whom produced very elegant solutions

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