Cambridge Technicals

Engineering

Level 3 Cambridge Technicals Certificates in Engineering **05822, 05823**

Level 3 Cambridge Technicals Diplomas in Engineering **05824, 05825**

OCR Report to Centres January 2017

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This report on the examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

OCR will not enter into any discussion or correspondence in connection with this report.

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Unit 1 - Mathematics for engineering

General Comments:

This is a mandatory unit across all qualifications in the Cambridge Technicals in Engineering suite.

While candidates generally performed to expectation, there appeared to be a number of gaps in their knowledge and other weaknesses. Although question 1 produced the best answers in the paper the algebraic manipulation elsewhere in the paper was usually quite poor.

It is hoped that the following points may help centres to prepare future cohorts of candidates for this unit.

Comments on Individual Questions:

Question 1: Algebra.
Most of the basic topics assessed in this question were understood by candidates who usually performed well. A few candidates had not got a good enough grasp of Algebra and made some quite elementary errors.
The part that was least well answered was part (d), changing the subject of a formula. When there are three terms, multiplying one term by, for instance, 2, requires every term to be treated similarly, for otherwise the equality ceases to hold. Typical errors were for instance, changing $s = ut + \frac{1}{2}at^2$ to $2s = ut + at^2$.

Question 2: Transformation of graphs.
This question was the one that was answered least well. A significant number of candidates did not understand what was required of them. Those that did have some understanding often lost marks because of poor drawing. For instance, the graph of $y = \mathrm{f}(x) + k$ is, for all values of x, k units above the curve $y = \mathrm{f}(x)$; they do not intersect. The curve $y = \mathrm{f}(x + k)$ is a transformation to the left of $y = \mathrm{f}(x)$. The curve $y = k\mathrm{g}(x)$ cuts the x-axis at the same points as the curve $y = \mathrm{g}(x)$. Very few candidates understood these points and of those who seemed to, many produced such poor graphs that it was not clear enough that the properties required were satisfied and so no credit could be given.
In part (c) most gave a straight line through the origin but not all got a correct gradient. Several solutions for part (ii) did not relate to part (i) and attempted elimination or substitution. Several also gave an x value only.

Question 3: The solution of equations.
In (a) candidates were able to construct the equations from the information given and to follow the standard procedure for solving them simultaneously (usually by elimination). However, a significant number forgot the context and did not read the question properly and so only gave final values of x and y rather than the cost of the screwdriver and spanner.
Part (b) was usually answered well.

Question 4: Cumulative frequency graph.
Almost all candidates were able to complete the table correctly and to produce a good cumulative frequency curve.
Most then were able to extract from the graph the values required. A few candidates did not realise that the interquartile range is a number and not a range.

Calculating values using similar triangles was accepted providing the answers fell within the acceptable range. The drawing of straight lines between the points to give the "curve" was not, however, acceptable.

Question 5: Calculus.
In part (a) there were some mixed responses and some were unaware how to carry out the integration. In part (b) the formula for v was often found correctly but then candidates were unable to use it to find the required results.
Part (c) was not done well and very few candidates got full marks. Obtaining the incorrect value for RC usually resulted in the final answer being incorrect by factors of 10 and some credit was given. However, the errors were usually compounded by poor algebra in the attempt to solve the equation.

Question 6: Trigonometry.
Part (a) was intended as a test of right-angled triangles, but many candidates did not realise this and used the sine rule with the angle 90^0. Correct answers by this process were credited but the extra manipulation required often introduced errors.
In (b) few candidates knew that in a triangle the largest angle was opposite the longest side. Consequently, many candidates who demonstrated a clear understanding of the cosine rule undertook a great deal of work to find all three angles before deciding which one was the largest. Others found another angle by the cosine rule and then used the sin rule to obtain the correct angle
The required formula in part (c) is in the formula book but a number used the wrong formula or wrote it down incorrectly. The most common incorrect formula was that for the area of the sector. Some candidates gave the answer in radians, ignoring the instruction of the question.

Unit 2 - Science for engineering

General Comments:

This is a mandatory unit across all qualifications in the Cambridge Technicals in Engineering suite.

Candidates should be reminded that where appropriate calculation questions should be supported with workings. Marks may be awarded for a correct method even if the answer is incorrect. There was evidence this series that because workings were not shown some candidates could not be awarded marks when previous errors were carried through to subsequent calculations.

There were a number of missing or incorrect units being used for numerical answers and candidates need to ensure that they convert values to consistent powers of ten before carrying out any calculation.

Candidates seemed to show greater understanding of learning outcomes 1 to 4 as they performed better in questions 1 to 4, compared to questions 5 and 6.

Comments on Individual Questions:

Question 1:
Q1 (a): Candidates generally either knew all these prefixes or very few.
Q1 (b): Many candidates were able to define relative error, but a few gave an imprecise definition.
Q1 (c): Some candidates did not comprehend the difference between significant figures and decimal places. A fairly common error was to calculate measured value divided by true value rather than error divided by true value.

Question 2:
Q2 (a): Some candidates did not understand the difference between mass and weight, and there were also a number of candidates who correctly calculated the weight but omitted or used the incorrect units.
In part (ii) some candidates realised that they needed to use Pythagoras Theorem to find the tension, but used the incorrect values.
In part (iii), instead of using the relatively simple equations for the trigonometric functions for right angled triangles, some candidates attempted to use the cosine rule, and then got confused about which values or force to use. A few candidates attempted to measure the angle from the diagram using a protractor rather than calculate it from the value for the forces.
Q2 (b): Many candidates omitted units for the distance in part (i) although this was not penalised in the mark scheme, and some used the unit for velocity instead of acceleration in parts (ii) and (iii). Some candidates were able to calculate the acceleration from the graphical data in part (ii) than the data given in text form in part (iii) and vice versa.

Question 3:
Q3 (a): Many candidates were able to calculate voltage and resistance in this series circuit, but there were many cases of omitting the unit. Some candidates showed the working for all three resistors in part (iii) but omitted to show which resistor was which. In part (iv) some candidates chose a correct equation to calculate power, but then substituted values for the quantities either for the whole circuit or the incorrect resistor. Some candidates found the total power provided by the supply and then subtracted the power loss from the resistor.

Q3 (b): Many candidates were able to identify the SI unit for Inductance, but did not know the equivalent in SI base units.

Question 4:
Q4 (a): Some candidates were able to correctly identify the features of a stress strain graph, but there was some confusion between yield stress and elastic deformation.
Q4 (b): There were several responses given without units or with the incorrect powers of ten. More candidates were able to calculate the Young Modulus in part (iii) and part (ii) seemed to cause the most problems.

Question 5:
Q5 (a): Many candidates had difficulties defining 'viscosity'. Many attempted to describe a viscous liquid rather than viscosity, and many explanations were vague.
Q5 (b): Candidates performed slightly better here, but there was often a lack of scientific terminology used.
Q5 (c): These were again calculations where there were several errors of units or powers of ten. Some candidates added the height of water to the height of mercury in the calculations. There was also some confusion about the terms absolute pressure and gauge pressure.

Question 6:
Q6 (i): In a 'show that' question candidates are expected to show all their working to gain full credit and some candidates did not do this clearly. Most candidates were able to calculate the volume of the box but then got stuck and they did not use the correct equation. Some candidates were unable to rearrange the equation and some candidates did not convert the temperature into Kelvin, although this was better than in the previous series.
Q6 (ii): Some candidates did not show working in this question so may not have gained any credit for an attempt to use the correct equation. Again there were some candidates who did not use temperatures in Kelvin.

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