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Engineering
EG308 Paper 01

Mathematical Techniques and Applications for Engineers

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Mathematical Techniques and Applications for Engineers

There were over 170 candidates entered for the series. Across the scripts, there was clear evidence of some confident application of techniques and working, with an increase in the successful application of some of the more complex mathematical principles. In some cases, simple errors could have been avoided, if candidates checked their working. There was little evidence across the scripts of this. Centres should remind candidates of this important procedure.

Following marking of scripts, each task has been reviewed to highlight good practice and some common errors.

Question 1(a)

Transposition was generally performed well, although some candidates did not take the square root when substituting the values and left the answer as 132.

Questions 1(b) & 1(c)

Candidates demonstrated a good understanding of the laws of logarithms. Over half the candidates achieved the full marks for Q1(b), with some minor errors in solving the natural logarithms, reducing this value for part Q1(c) of the question.

Question 2(a)

All candidates plotted the graph accurately and a large proportion understood the mathematical application to find the gradient and intercept. Of those who successfully calculated the law, most applied the values given and answered part (iii) correctly. Most candidates who gave inaccurate answers for part (ii) managed to provide a 'follow through' answer correctly. More than 40% of the candidates achieved full marks for this question. Common basic errors in calculating the gradient and identifying the intercept were evident here.

Question 2(b)

This relatively straight forward task proved to be a problem for many candidates. Overall more than 60% of candidates scored marks here, although there were basic errors in the rest of the scripts. Checking the solution by re-working would have been useful for many candidates who did not score marks for this task.

Question 2(c)

This question could be solved using the quadratic formula or by factorising. The number of candidates scoring full marks was just more than those who did not score in this task. In addition, many candidates stated the answer as -11 or 9, rather than indicating that the answer must be a positive for the factory output scenario.

Question 3(a)

The majority of candidates were able to apply the correct rules and achieve the correct answer with a small minority mistakenly using Sin as opposed to Tan to calculate the answer.

Question 3(b)

Many candidates were able to interpret this task and identify the horizontal and vertical components as simply the sides of the triangle. The technique of F Sin 60 and F Cos 60 were then applied correctly to obtain the required values.

Question 3(c)

Most candidates applied the Sin Rule correctly with varying degrees of accuracy with a small number of candidates applying the Cosine Rule incorrectly. Overall, this question was well attempted and most candidates gained marks, particularly at the higher end.

Question 4(a)

Calculation of the overall volume was answered well by the candidates and over 50% were able to calculate correctly for the finished component. There was variation in the candidates' ability to calculate the volume of the missing circle/half circle but it followed that the correct calculation in this area was followed with an overall correct calculation for the volume of the finished product. Basic errors here were using the halving of the radius for the semi-circle when calculating the area.

Questions 4(b) and 4(c)

Basis errors were evident here, with the conversion from radians to degrees and rad s^{-1} to rev min^{-1}. Almost half the candidates for Q4(b) lost marks and over a third for Q4(c) due to incorrect application of this simple conversion technique.

Question 5(a)

Some candidates did not state the value of the mode, instead provided a description, in most cases, the front fog light, which was incorrect.

Question 5(b)

Most candidates understood the technique to determine the median, although a minority had this confused with the mean and added values.

Question 5(c)

Over 80% of candidates achieved the full mark for this relatively straight forward task. Minor numerical errors were evident in some scripts. Checking work could have prevented this.

Question 5(d)

The majority of candidates were able to identify the term central tendency to obtain marks in this task. Centres should observe the nature of this task and appreciate that candidates should have an understanding of the terms relating to statistical data in addition to knowing how to determine values such as mean, mode etc.

Question 5(e)

Just over half the candidates correctly identified that the median value would reduce, with the actual value stated by many candidates.

Question 6(a)

There appeared to be two trends which were present in the answers to this question. The first trend resulted in a text book style answer using simple differentiation and the managing to substitute and calculate the correct answer. The second trend involved the candidates substituting into the given equation without attempting differentiation.

Question 6(b)

A good attempt at this question was made by most candidates with a number of interpretations of the calculus process. Approximately 30% resulted in the award of full marks with rest achieving varying degrees of success. This value was offset with more than half the candidates who did not achieve any marks due to incorrect application of the basic principle.

Question 6(c)

Candidates performed better in this task than Q6(b); however the candidates appeared to have difficulty with applying the integration process correctly which resulted in many being unable to integrate and to determine the distance travelled correctly. Most candidates attempted to answer the question and there were a diverse range of attempts to integrate and calculate the distance travelled by the vehicle with varying degrees of accuracy.

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