AS LEVEL
FURTHER MATHEMATICS

7366/2D Discrete
Report on the Examination

7366
June 2022

Version: 1.0

Question 1

Most students were awarded the mark for part (a), but fewer students were awarded the mark for part (b), possibly due to the increased demand of the term ‘simple-connected’ when compared with ‘tree'.

Question 2

The vast majority of students were awarded the mark in part (a); where this mark was not awarded, it was often for an arithmetical error in finding the sum of the correct capacities, or for including an incorrect arc.

Three quarters of students were awarded the mark in part (b). The most common error in this part was to simply find the wrong cut or using incorrect notation to define the cut.

Part (c) proved more difficult and discriminated between higher and lower attaining students. The ‘Fully justify your answer’ sentence is a nudge to a complete argument and all associated references to theorems being required for all marks to be awarded. In this part, reference to the ‘maximum-flow minimum-cut theorem’ was required, which many students did not include in their answer. The follow-through marks here enabled students who had not been awarded the mark in either (a) or (b) to still have a possibility of being awarded the mark in this part.

Question 3

Part (a) was found to be very straightforward with nearly all students being awarded the mark.

Part (b) was more challenging with just under half of the students being awarded the full 3 marks. The deduction in the question required a logical study of what would happen to each of *I*, *J* and *K*’s earliest start times and latest finish times. Where students were not awarded the marks, it was often due to being too vague and not explicitly stating what the question asked for. The best solutions followed a clear logic and often used bullet points or a small table to clearly show the effects asked for.

Question 4

Part (a) was answered well, this clearly being a familiar topic. Where mistakes were made, it was often due to the nearest neighbour algorithm not being used or using a starting point other than Deganwy.

Part (b) was found more challenging than part (a) with some students electing to use the nearest neighbour algorithm again, this time not including Aber in the cycle. The best solutions split the working into two parts, one for the minimum spanning tree of the reduced network and one for considering the two shortest arcs connected to Aber.

Question 5

In part (a) the vast majority of students followed the instruction in the question and used Euler’s formula. Where mistakes were made, it was often due to incorrectly quoting Euler’s formula, and then subsequently finding an incorrect integer value of f.

Part (b) was found to be more challenging than was anticipated. There was a significant number of partial attempts at this question, with some students simply copying Figure 1 on to Figure 2 with no adjustments and others omitting arcs.

Question 6

Nearly all students were awarded the full 2 marks in part (a).

Less than 40% of students were awarded the mark in part (b). The best answers were full explanations based on left and right multiplication, whereas answers based solely on left multiplication were not awarded the mark due to the argument being incomplete.

Around 80% of students were awarded at least 1 mark in part (c), but only a small minority were awarded both marks. It should be noted that when commenting on the validity of a statement, it is important to provide a full argument and then give a final concluding comment on whether the statement is true or false.

Question 7

The vast majority of students were awarded the mark in part (a). In the cases where students did not receive the mark, this was often due to a mistake using mathematical language such as confusing ‘dominated by’ and ‘dominates.’

Part (b) provided the full range of marks with less than half of students receiving full marks. There were two main approaches: the standard approach of drawing a graph and then identifying the optimal vertex; and the alternative of solving the three possible equations (formed by equating each pair of expected gains). The former was much more successful, as the latter method often led students to identify an incorrect value for the probability variable. Another common source of mistakes was a poorly plotted graph where a ruler had not been used to draw the expected gains.

Question 8

Part (a) was found challenging by most students. The most common reason for the mark not being awarded was a lack of detail in the written answer, or mistakenly thinking that $16x$ was the number of garlic cloves that could be planted per square metre.

In part (b)(i) the majority of students were awarded 2 of the 3 marks, as many were able to produce three correct constraints for the problem. However, most students did not include the constraint that x and y must be integers and did not gain the final A1 mark.

Part (b)(ii) also proved to be challenging as most students did not provide a suitable limitation of the model in the context of the problem. It was most often the highest attaining students that were awarded the mark for this part.

In part (c)(i) most students were able to identify the constraint which had changed, but fewer students were then able to go on and explain what this could mean in the context of the problem.

Many students were able to identify the optimal vertex in part (c)(ii) and then calculate the maximum area. Where students did make mistakes, it was often in identifying a sub-optimal vertex of the feasible region. The best solutions often tabulated the vertices of the feasible region along with the corresponding area, and then identified the maximum area. This approach bypasses any issues students may have with maintaining the gradient of an objective line.

Mark Ranges and Award of Grades

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