Examiners' Report/
Principal Examiner Feedback

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GCE Decision D2 (6690) Paper 1

PEARSON

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Decision Unit D2
Specification 6690

General

The paper proved accessible to most candidates, who demonstrated good knowledge and understanding, and most had sufficient time to complete the paper, although some blank responses were seen to question 7.

There seemed to be sufficient marks available to E grade candidates and for A grade candidates to demonstrate their quality.

The general quality of presentation was good but there were many arithmetic errors, especially in questions 1 and 2 but less so in questions 3, 5 and 7. Poor handwriting caused fewer problems than in previous series.

Candidates continue to use clear and efficient styles of presentation and most made good use of the tables given in the answer book.

Candidates are reminded that they should not use methods of presentation that depend on colour. Candidates are advised to complete diagrams in (dark) pencil.

Report on individual questions

Question 1

This question was a good starter with about half the candidates getting at least 9 out of the 10 marks and less than 10% scoring under 5 marks. Most candidates successfully completed the table of values, although a significant number made at least one arithmetical mistake often getting 44 instead of 42 for BD.

Most candidates applied the Nearest Neighbour algorithm correctly, although a small number omitted the return to A. Some candidates incorrectly doubled the value that they had calculated to give their upper bound. Although most candidates found a residual spanning tree, there were a significant number of errors in this part of the question. A significant number of candidates used an incorrect arc in their RMST often DF instead of DE. A number of candidates added AD instead of AB. Some candidates failed to show any working, just stating the value of 91km, and were penalised.

Question 2

This was another good source of marks for many with 52% of the candidates scoring at least 8 out of 9 marks and 11% scoring under 3 marks. Most candidates dealt with the dummy correctly. Some candidates used the figures for the initial solution, rather than the transportation costs, to calculate shadow costs and improvement indices, consequently losing several marks throughout the question. There were some arithmetical errors in calculating the 4 improvement indices and some wasted time in checking the five given ones. Most were able to find a correct stepping stone route based on their most negative improvement index, although some tried to include 4C and/or 4D in their route. The majority of candidates who found a valid route went on to give an improved solution, although some left 0 in 3C or omitted the values in 4C and 4D. Although the question required the method to be used just once, a minority of candidates wasted time doing further iterations.

Question 3

This question proved a good discriminator. 41% of the candidates were able to gain at least 9 marks out of the 10 but nearly 20% scored under 3 marks. Many candidates made errors reading off the profit equation, either omitting one or more terms, getting a sign wrong or including two equal signs.

Most candidates chose the correct pivot and attempted to divide through, although there were some arithmetical errors. A small number forgot to change the base variable. A negative pivot was chosen by a worrying number of candidates and a small number of candidates chose an incorrect pivot from the y row. Those candidates who had dealt with the pivot correctly generally went on to apply the correct row operations, although a significant number made one or more arithmetical error. These candidates then went on to at least state their four basic variables, although some did not give a value for P, instead stating the full expression from the profit row, or gave a value for z instead of r. A small number of candidates read their values off the bottom row of the table.

Question 4

This question also proved a good discriminator. 45% of the candidates were able to gain at least 8 marks out of the 9 but 20% scored under 3 marks.

Some candidates failed to spot that row 3 dominated row 1 and did not reduce the matrix. Some of these went on to formulate a simplex solution to the problem. The majority of the candidates did reduce the matrix, although a small number deleted row 3 or even column 2. They then went on to set up three probability equations, although some made errors when simplifying these. However an increased proportion of candidates were taking "p" and "p − 1" as the two row probabilities. Most candidates then drew a graph, although a number of these over-ran the boundaries of $p = 0$ and $p = 1$. Others drew incorrect lines or did not use a ruler. Candidates then chose their optimum point, although some selected the wrong point.

A disappointingly large minority did not draw a graph, losing two marks, and then simply found all three intersection points and then picked one, this is not the correct method, so they lost the next four marks too. This 'method' should not be encouraged. Most of those who gained the final method mark went on to calculate p and state Laura's strategy, although a number omitted 'never play 1', most correctly stated the value of the game.

Question 5

This question also proved a good discriminator. 27% of the candidates were able to gain at least 14 marks out of the 15 but 8% scored under 6 marks.

Most candidates demonstrated a basic understanding of the network flows topic by gaining the first 6 marks, and a good number went on to find routes SBEHT and/or SCBEHT and their correct flows. A pleasing proportion also found the more challenging route SB(C)EHDAFGT, which includes backflows. A common error was to attempt a flow of 2, in the wrong direction, along BA.

In part (e) clear consistent flow diagrams were often seen, though the careless omission of any one flow, often a zero, lost both marks here, as did diagrams with full labelling, rather than just the maximum flow on each arc.

In part (f) a surprising number of good solutions finished on a low note, either failing to find the correct cut or unable to quote maximum flow = minimum cut.

Question 6

This question proved an excellent discriminator. Just over 40% of the candidates were able to gain at least 8 marks out of the 9 but 21% scored under 3 marks.

Many candidates had difficulties with this question, failing to define their variables correctly. Some of those who did define their variables in terms of P, Q, R then went on to use notation such as x_{11} rather than x_{PA}. A good number of candidates stated that the problem was to be minimised and gave the correct expression. A significant number of candidates then made errors with their constraints, either using inequalities, having coefficients other than one or not making each one equal to zero. It was evident that many candidates had difficulty handling subscripts consistently and correctly. Some candidates treated the question as a sort of game theory question or ending up with six variables rather than nine. Completely correct solutions were also frequently seen however in part (b) a number of candidates made errors, either making each value negative (and perhaps subtracting the most negative from each row), just reducing rows and/or columns or omitting this altogether.

Question 7

This was a high scoring question, with 64% of the candidates scoring at least 12 out of the 13 marks and only 10% scoring under 8 marks. It was much better done than in previous series, probably due to the model provided by the printed start, in the answer booklet. Almost all extracted the relevant figures from the tables in the question and use them correctly. Some lost 3 marks due to omitting stage 4, for the start from London. Many wasted a mark failing to multiply 106 by 100 for the income in £, or indeed multiplying by 1000 instead. A mark was also lost by those who failed to include both starting and finishing at London in their optimal schedules.

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