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Examiners' Report

Summer 2014

Pearson Edexcel GCE in Decision Mathematics D2R (6690/01R)

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Mathematics Unit Decision Mathematics 2

Specification 6690/01R

General Introduction

The vast majority of students demonstrated sound knowledge of all topics, and were able to produce well-presented solutions, making good use of the tables and diagrams, printed in the answer book.

Report on Individual Questions

Question 1

The first question was accessible to students. Nearly all applied the north-west corner method correctly in Q01(a) and completed Table 1 correctly with the missing improvement indices in Q01(b). The majority went on to give the correct improved solution in Q01(c), although some had an extra theta in either cell AP or BQ, not understanding the requirement for balance both across rows, and down columns. A significant number of students had an additional zero in AQ, the exiting cell, and some did not state the entering or exiting cell. The vast majority correctly stated the cost of the improved solution in Q01(d).

Question 2

This question also proved to be accessible. The majority of students correctly stated in Q02(a) the difference between the classical and practical travelling salesperson problem although some incorrectly referred to the number of times an arc needed to be visited or argued along the lines of, “the practical TSP is more practical and gives a better answer”. In Q02(b) the application of the Nearest Neighbour algorithm to find an upper bound and the lower bound calculation in Q02(c) were nearly always done correctly. Nearly all students could then go in Q02(d) to write down the smallest interval which contained the optimal length of the route.

Question 3

Nearly all students successfully reduced columns and they then went on to set up the three correct probability equations (although, on occasion, arithmetical errors occurred when students simplified these expressions). It was unfortunate that some graphs were poorly drawn, some without rulers, with uneven scales or so cramped that it was difficult for students to identify the correct optimal point. Most students then attempted to solve the correct pair of equations for what they considered to be their optimal point. While many had the correct probabilities for playing columns 2 and 3 a significant number of students did not state the player B should never play column 1. Most went on to give the correct value of the game to player B in Q03(b).

Question 4

Q04(a) was extremely well answered with nearly all students applying the simplex algorithm correctly by

- choosing the correct pivot in both iterations,
- dividing the pivot row correctly and changing the basic variables,
- using the new (or old) pivot rows to update the other rows and,
- stating the correct row operations.

Q04(b) and Q04(c) were found to be more challenging to students. It was common in Q04(b) for students to write either $P - 32.5x - 15r + 2.5s = 675$ or $P = 32.5x + 15r - 2.5s = 675$ instead of the correct $P + 32.5x + 15r - 2.5s = 675$ and in Q04(c) many students did not give a fully correct reason why the new tableau was not optimal – it was insufficient to solely state that there were negatives in the profit row as the question explicitly asked the students to consider the profit equation and not the tableau.

Question 5

In Q05(a) many students did not add a supersource or supersink to both Diagram 1 and Diagram 2 which meant that a lot of subsequent marks were lost in later parts. Most students who did add the supersource and supersink went on to score full marks in Q05(a) and Q05(b).

In Q05(c) many increased the flow by 21 and listed their flow augmenting routes correctly. Most students went on to attempt the final flow diagram in Q05(d), although a significant number of students did not gain full marks as they did not have a flow of 102. A number of errors were often present such as two numbers on some or all of the arcs and a significant number either left one arc blank or had an inconsistent flow pattern, most notably at B or D.

In Q05(e), many gained the method mark, for a cut, but some students, who had been successful up to this point, attempted a cut not equal to 102, or they failed to quote the ‘maximum flow – minimum cut’ theorem. It is also advisable for students to draw the cut on the diagram showing their maximal flow pattern rather than stating the arcs that the cut passes through. Those that quoted the theorem without a cut lost both marks. Students should be reminded to refer to the original diagram containing the flow capacities, when considering possible cuts, rather than their optimal solution.

Question 6

The majority of students correctly defined the values taken by x_{ij} and the set of values that i and j could take. However, the majority of students did not define the objective function correctly as many decided to simply ignore x_{C4} and x_{D1} rather than making the coefficients of these two variables sufficiently large. A significant number of students made errors with their constraints, by writing them as inequalities, ignoring x_{C4} and x_{D1}, using coefficients other than 1 (or having right hand sides not equal to 1) or with inconsistent notation.

Question 7

Of those students that scored no marks a majority left this part blank or had little understanding of how to use dynamic programming to solve this particular type of problem. Of those students who attempted this dynamic programming question the only errors seen were usually down to misreading values from the original table or from the students' own table. Occasional arithmetical errors occurred and sometime the student missed out rows from stage 2 (dolls house) but on the whole students answered this question well.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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