Examiners' Report/
Principal Examiner Feedback

Summer 2013

GCE Decision D2 (6690)
Paper 01R

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Decision Mathematics 2 (6690R)

Introduction

The vast majority of candidates 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

This first question provided an excellent start to nearly all candidates with 76.7% scoring full marks. Nearly all dealt with the need to find an allocation that maximised the total profit and very few minimisations were seen. The only errors noted were down to arithmetical slips rather than in the method of applying the Hungarian algorithm.

Question 2

This question also proved to be a good source of marks to candidates with over two thirds of all candidates scoring full marks. Occasionally the shortcut given in part (a) was incorrect (or left blank) but the application of the Nearest Neighbour algorithm in part (b) to find an upper bound and the lower bound calculation in part (c) were nearly always done correctly. Nearly all candidates could then go in part (d) to write down the smallest interval which contained the optimal length of the route.

Question 3

While the mode mark on this question was 7 (out of 8) obtained by 31.7% of candidates, 26.7% of candidates scored full marks. Most candidates gave the correct reason in part (a) that the solution would have been degenerate for why a zero had been placed in the cell B3, however, a few candidates gave incorrect reasons or left this part blank. While part (b) was nearly always fully correct part (c) was not as successfully answered. While most stated their entering and exiting cells most candidates did not state their stepping stone route even though this had been explicitly asker for in the question. This was probably the reason why the modal mark on this question was not full marks.

Question 4

Full marks was obtained by 20% of candidates and 80% scored 6 marks or more on this question on game theory. Nearly all candidates successfully reduced rows and they then went on to set up the three correct probability equations (although, on occasion, arithmetical errors occurred when candidates simplified these expressions). It was unfortunate that many graphs were poorly drawn, some without rulers, with uneven scales or so cramped that it was difficult for candidates to identify the correct optimum point. Most candidates then attempted to solve the pair of equations for what they considered to be their optimum point. While many had the correct probabilities for playing row 1 and 3 the majority of candidates did not state that Robin should never play row 2. Most went on to give the correct value of the game.

Question 5

This question gave rise to a good spread of marks and proved a good discriminator.
The mode was 6 marks (out of 8) gained by 35% of the candidates, 20% scored full marks and 73.3% of the candidates scored 6 or more marks.

Part (a) was extremely well answered with nearly all candidates applying the simplex algorithm correctly by choosing the correct pivot, dividing the pivot row correctly and changing the basic variable, using the new (or old) pivot row to update the other rows and stating the correct row operations.

Part (b) and (c) caused more difficulty to candidates. It was common in part (b) for candidates to write $P = x + 4s + 18t = 240$ instead of the correct $P + x + 4s + 18t = 240$ and in part (c) many did not give a fully correct reason why the new tableau was optimal – it was insufficient to solely state that there was no negatives in the profit row as the question explicitly asked the candidates to consider the profit equation and not the tableau.

Question 6

This question proved to be an excellent discriminator and gave rise to a good spread of marks. Only 10% scored full marks while the mode was 10 (out of 13) scored by 20% of candidates. Part (a) was nearly always answered correctly. In part (b) many did not add a supersource and supersink to both diagram 1 and diagram 2 which meant that a lot of subsequent marks were lost in later parts. Most candidates who had added the arcs correctly from S and T usually went on to answer part (c) correctly and many increased the flow by 5 and listed their flow augmenting routes in part (d) although surprisingly many did not state the maximum flow at this point (even though this was requested in the question). Part (e) was rarely done correctly with the most common error being either arc FG left blank or a flow of 10 being stated for this arc – candidates are advised to check each node for ‘flow in = flow out’. Those that did have part (f) correct usually went on to prove that their flow was maximal by finding a correct cut and applying the maximum flow – minimum cut theorem.

Question 7

This proved to be an excellent source of marks for many candidates with 40% scoring full marks and 76.6% scoring 5 marks or more. The three most frequent omissions by candidates were not stating that V was the value of the game to player A, not stating that the objective was to maximise V and finally not defining the probability variables. The constraints however were nearly always given correctly.

Question 8

While 21.7% scored no marks on this question, 53.3% scored all 12 marks and 75% scored 10 marks or more. Of those that scored no marks a majority left this part blank and many did not seem to understand how to use dynamic programming to solve this particular type of problem. Of those candidates who genuinely attempted this dynamic programming question the only errors seen were usually down to misreading values from the table, arithmetical errors, not including the necessary ‘zero’ rows or a failure in converting their final answer into a correct value (a number gave the final answer as either 215 or as 215000).

Grade Boundaries

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