InkMaths

QUESTION WORKBOOK

Allocation and the Hungarian algorithm

Decision Mathematics 2 · Year FM

6 questions · 25 marks

NAVY SCREEN EDITION

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SECTION A · Warm-up

A1 Explain why subtracting the smallest entry of a row from every entry in that row cannot change which allocation is cheapest. [2]

A2 A 5 by 5 reduced matrix needs only 4 lines to cover its zeros. State the next step. [2]

SECTION B · Standard

B1 Workers P, Q and R are each to be given one of the jobs 1, 2 and 3. The cost of P doing the three jobs is 14, 9, 12; the cost of Q is 11, 8, 15; the cost of R is 13, 10, 9. Use the Hungarian algorithm to find the allocation of least total cost, showing each reduced matrix. [6]

B2 A table gives the profit made when each of P, Q and R does each of the jobs 1, 2 and 3. For P the profits are 14, 9, 12; for Q they are 11, 8, 15; for R they are 13, 10, 9. Find the allocation of greatest total profit. [5]

B3 A firm has 4 workers and only 3 jobs, and one worker refuses job 2. Describe the two adjustments needed before the algorithm is applied. [3]

SECTION C · Stretch

C1 Workers P, Q and R are each to be given one of the jobs 1, 2 and 3. The cost of P doing the three jobs is 6, 11, 11; the cost of Q is 9, 17, 13; the cost of R is 12, 7, 5. Reduce the matrix, show that the line test fails, augment, and give the allocation and its cost. [7]