

QQQ – Decision 2 – Chapter 5 – Dynamic Programming (Version 1)

Total Marks: 26

(26 = Platinum, 23 = Gold, 21 = Silver, 18 = Bronze)

1.

- (a)** State Bellman's principle of optimality. **(1)**
- (b)** Explain what is meant by a minimax route. **(1)**
- (c)** Describe a practical problem that would require a minimax route as its solution. **(2)**

(Total 4 marks)

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2.

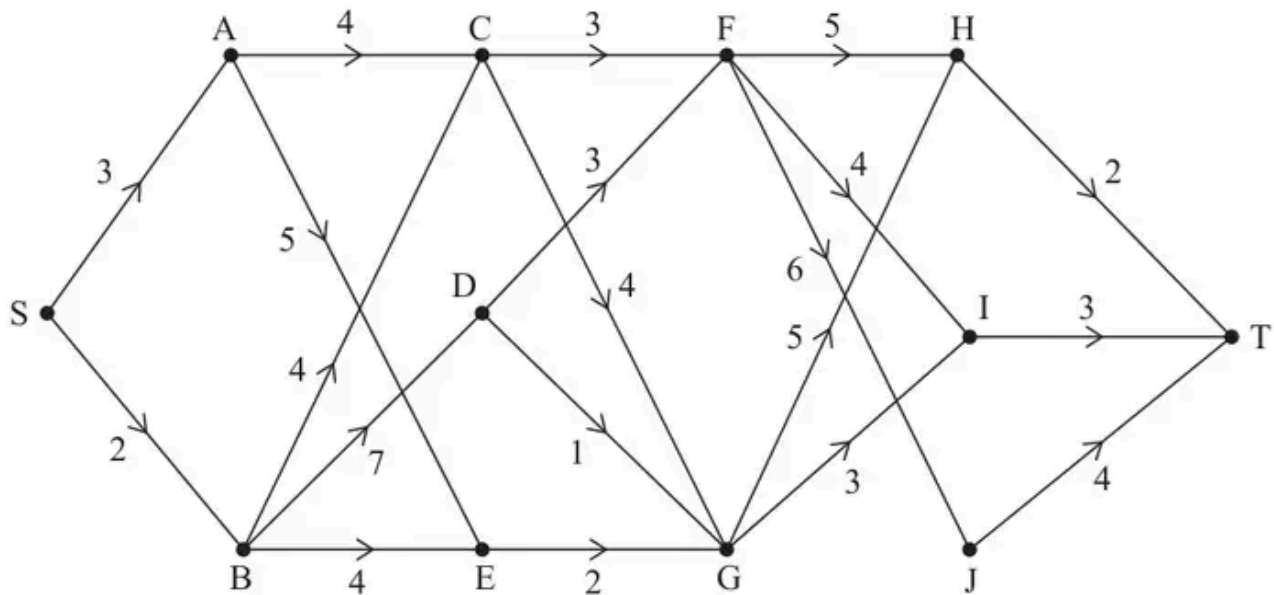


Figure 2

The staged, directed network in Figure 2 represents the roads that connect 12 towns, S, A, B, C, D, E, F, G, H, I, J and T. The number on each arc shows the time, in hours, it takes to drive between these towns.

Elena plans to drive from S to T. She must arrive at T by 9 pm.

- (a) By completing the table in the answer book, use dynamic programming to find the latest time that Elena can start her journey from S to arrive at T by 9 pm. (9)

[The table in the answer book has columns headed Stage, State, Action, Destination and Value.]

- (b) Hence write down the route that Elena should take. (1)

(Total 10 marks)

3. A manufacturer can export five batches of footwear each year. Each exported batch contains just one type of footwear. The types of footwear are trainers, sandals or high heels.

The table below shows the profit, in £1000s, for the number of batches of each type of footwear.

Number of batches	0	1	2	3	4	5
Trainers	0	50	90	170	225	295
Sandals	0	70	110	165	245	300
High heels	0	75	115	x	235	305

The total annual profit is to be maximised.

- (a)** Use dynamic programming to determine the two possible values of the maximum total annual profit, giving one of these values in terms of x . **(10)**

Given that the maximum total annual profit is £320 000

- (b)** advise the manufacturer on the possible ways in which the five batches should be allocated. **(2)**

(Total 12 marks)