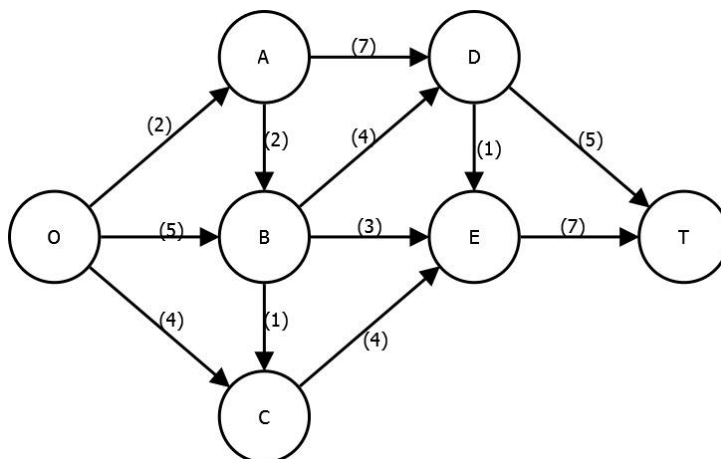


# Operations Research III: Theory

## Quiz for Week 4 (Network Flow)

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1. Consider a directed network depicted below.



Let the arc weights be lengths. For the following statements, select all that are correct.

- (a) The path  $(0, B, A, D, T)$  does not exist.
- (b) The total length of the path  $(0, A, B, D, T)$  is 10.
- (c) The total length of the path  $(0, A, B, D, T)$  is 13.
- (d) There is no cycle in this graph.
- (e) None of the above.

**Note for the instructing team only:**

2. Continue from the previous question. What is the total distance of a shortest path?

- (a) 12.
- (b) 13.
- (c) 14.
- (d) 15.
- (e) None of the above.

**Note for the instructing team only:** A shortest path is  $(0, A, B, D, T)$ .

3. Continue from Question 1. Let the arc weights be flow capacities. What is the flow value of a maximum flow solution?

- (a) 10.
- (b) 11.
- (c) 12.
- (d) 13.
- (e) None of the above.

**Note for the instructing team only:**

4. Continue from the previous question. Which of the following is not possible in a maximum flow solution?

- (a)  $x_{DT} = 4$ .
- (b)  $x_{ET} = 7$ .
- (c)  $x_{BC} = 1$ .
- (d)  $x_{DE} = 1$ .
- (e) None of the above.

5. Consider the following matrices

$$A = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}.$$

- (a)  $A$  is totally unimodular but  $B$  is not.
- (b)  $B$  is totally unimodular but  $A$  is not.
- (c) Both  $A$  and  $B$  are totally unimodular.
- (d) Both  $A$  and  $B$  are not totally unimodular.
- (e) None of the above.