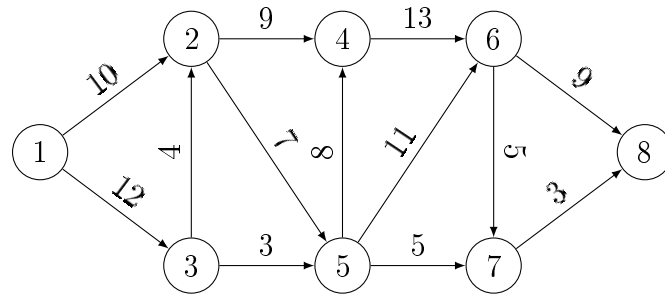


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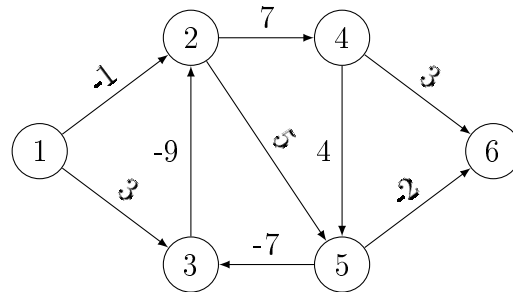
Plus court chemin (9 novembre 2018)

Question 1:

1. Soit le graphe suivant :



2. Citez 3 algorithmes qui peuvent être utilisés pour retrouver le plus court chemin entre le nœud 1 et tous les autres nœuds du graphe. Lequel est le meilleur ?
3. Calculez le coût du plus court chemin entre le nœud 1 et tous les autres nœuds du graphe et donner le vecteur des prédécesseurs π .
4. Donner l'arbre des plus courts chemins.
5. Soit le graphe suivant :



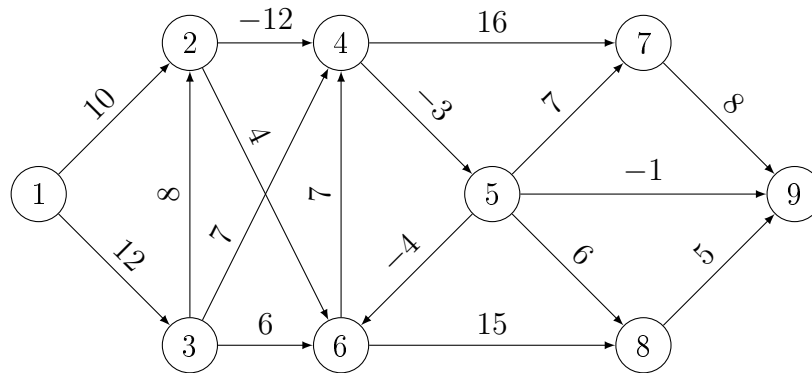
Calculez le coût du plus court chemin entre le nœud 1 et tous les autres nœuds du graphe.

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Question 2:

Consider the following network.



1. What are the optimal labels starting from node 1 ?
2. What is the Bellman's subnetwork ?
3. If the Bellman's subnetwork you found isn't a tree, identify a spanning tree satisfying Bellman's equations.

Question 3:

Consider the following transshipment problem :

$$\begin{aligned} \min & 7x_{12} + 6x_{13} + 3x_{23} + 2x_{24} + 7x_{35} + 4x_{54} + 4x_{46} + 5x_{56} \\ & 1 - x_{12} - x_{13} = 0 \\ & x_{12} - x_{23} - x_{24} = 0 \\ & x_{13} + x_{23} - x_{35} = 0 \\ & x_{24} + x_{54} - x_{46} = 0 \\ & x_{35} - x_{54} - x_{56} = 0 \\ & x_{46} + x_{56} - 1 = 0 \end{aligned}$$

What is the mathematical network associated to this problem ?

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Question 4:

The renovation of an apartment's living room breaks down into several tasks listed in the table below. The latter also contains the precedences to be respected during the planning of the works, as well as the duration of each task.

Task	Description	Precedence	Duration [days]
A	Door removal		1/2
B	Sanding and painting doors	A	3
C	Hanging doors	B, J	1/2
D	Peeling off wallpapers		1
E	Pulling electrical wires	D	1
F	Laying electrical outlet	E, H, I	1/2
G	Smoothing walls	E, A	2
H	Peinture du plafond	G	2
I	Ceiling painting	G	3
J	Painting frames	H, I	1
K	Ripping off the carpet	H, I, J	1/2
L	Sanding parquet	K	1
M	Impregnation and drying of parquet	L, F	4
N	Balcony painting		2
O	Change of solar protections	N	1

1. What is the mathematical network representation associated with this problem?
2. Identify critical tasks that can not suffer from any delay without delaying the project, and give the minimal timing of the duration of the work.
3. Calculate the earliest and the latest starting dates of each task.