

UFR MATHÉMATIQUES ET INFORMATIQUE



Université
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ALGORITHMIQUE AVANCÉE

IF05X040

Travaux Dirigés 6-7

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Partie exercices

Exercice 2.7.

Déterminer un arbre couvrant de poids minimal pour le graphe de la figure 2.3

Réponse. On peut utiliser l'algo de Prim et Kruskal, les resultat sont meme, le poids minimal est 12.

Exercice 2.8.

On considère un graphe valué G et un ensemble U de sommets. Proposer un algorithme qui détermine un arbre couvrant de poids minimal parmi ceux tels que tous les sommets de U sont des feuilles. Démontrer sa validité et préciser sa complexité.

Réponse.

Exercice 2.9.

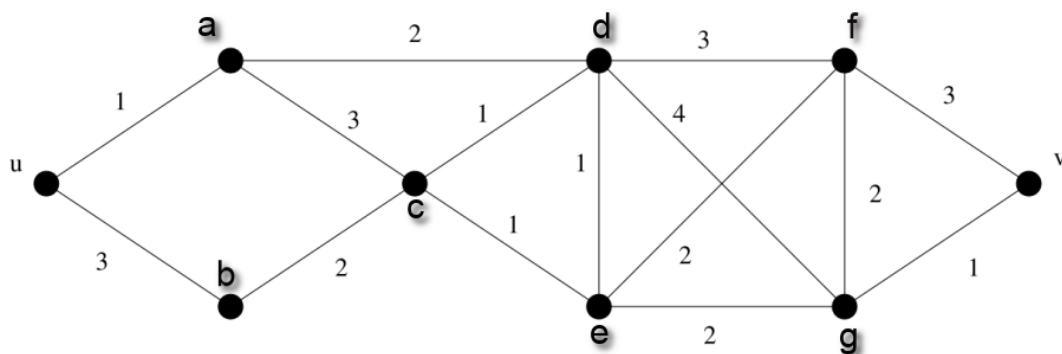


FIGURE 2.4 – .

Réponse.

l'algorithme de Dijkstra

Sommet	u	a	b	c	d	e	f	g	v
Distance	0	1	3	∞	∞	∞	∞	∞	∞
Distance	0	1	3	4	3	∞	∞	∞	∞
Distance	0	1	3	4	3	4	6	7	∞
Distance	0	1	3	4	3	4	6	6	∞
Distance	0	1	3	4	3	4	6	6	7
Distance	0	1	3	4	3	4	6	6	7

Exercice 2.10

A partir de l'algorithme de Dijkstra, construire un algorithme qui détermine le diamètre de chaque composante connexe d'un graphe. Quelle en est la complexité ?

Réponse. On fait l'algo Dijkstra pour tous les sommets dans chaque composante connexe, retourner le plus grand nombre.

Complexity : $n \times \text{algo Dijkstra}$ (on considère c'est $O(m + n \log n)$ à l'aide de tas de Fibonacci)

Donc c'est $O(n(m + n \log n))$

Exercice 3.1.

Réponse.

	G1	G2	G3
Chemin eulérien	true	true	false
Cycle eulérien	false	true	false
Chemin hamiltonien	true	false	true
Cycle hamiltonien	true	false	false

Exercice 3.2.

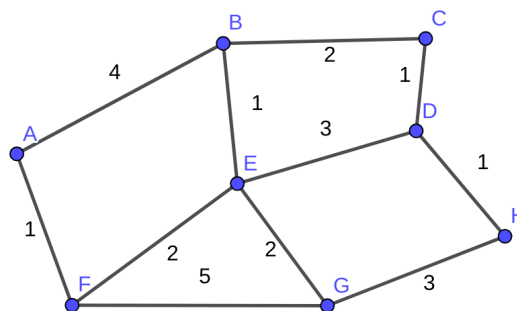


FIGURE 3.2

Réponse. Au premier, il faut trouver les sommets qui degré est impair. Donc on a sommet F, B, G, D. Ensuite on construit le Figure 3.2a

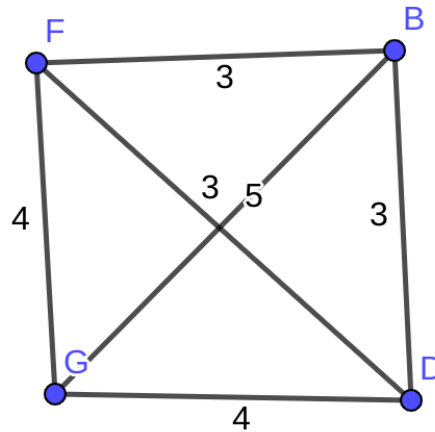


Figure 3.2a

Selon le Figure 3.2a, on veut connecter les 4 sommets avec le minimal poid, on peut choisir Edge(F, G) et Edge(B, D).

On peut ajouter un Edge(B, D) dans le Figure 3.2, donc il y a seulement 2 sommets impaire, on peut trouver un chemin eulerien.

Le poids minimal total est l'addition de tous les poids de Figure3.2 et Edge(F,G), Edge(B,D).

Tous les poids de Figure3.2 : $1 + 4 + 2 + 1 + 1 + 3 + 2 + 2 + 5 + 1 + 3 = 25$

Avec les 2 autre edges : $25 + 3 + 4 = 32$

Donc le poids minimal total est **32**.

Question 1

What is the airspeed velocity of an unladen swallow?



Answer. While this question leaves out the crucial element of the geographic origin of the swallow, according to Jonathan Corum, an unladen European swallow maintains a cruising airspeed velocity of **11 metres per second**, or **24 miles an hour**. The velocity of the corresponding African swallows requires further research as kinematic data is severely lacking for these species.

Question 2

How much wood would a woodchuck chuck if a woodchuck could chuck wood?

- (a) Suppose “chuck” implies throwing.
- (b) Suppose “chuck” implies vomiting.

Answer.

- (a) According to the Associated Press (1988), a New York Fish and Wildlife technician named Richard Thomas calculated the volume of dirt in a typical 25–30 foot (7.6–9.1 m) long woodchuck burrow and had determined that if the woodchuck had moved an equivalent volume of wood, it could move “about **700 pounds (320 kg)** on a good day, with the wind at his back”.
- (b) A woodchuck can ingest 361.92 cm^3 (22.09 cu in) of wood per day. Assuming immediate expulsion on ingestion with a 5% retainment rate, a woodchuck could chuck **343.82 cm^3** of wood per day.

Question 3

Identify the author of Equation 1 below and briefly describe it in Latin.

$$P(A|B) = \frac{P(B|A)P(A)}{P(B)} \quad (1)$$

Answer. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Praesent porttitor arcu luctus, imperdiet urna iaculis, mattis eros. Pellentesque iaculis odio vel nisl ullamcorper, nec faucibus ipsum molestie. Sed dictum nisl non aliquet porttitor. Etiam vulputate arcu dignissim, finibus sem et, viverra nisl. Aenean luctus congue massa, ut laoreet metus ornare in. Nunc fermentum nisi imperdiet lectus tincidunt vestibulum at ac elit. Nulla mattis nisl eu malesuada suscipit.

Question 4 (bonus marks)

The table below shows the nutritional consistencies of two sausage types. Explain their relative differences given what you know about daily adult nutritional recommendations.

<i>Per 50g</i>	Pork	Soy
Energy	760kJ	538kJ
Protein	7.0g	9.3g
Carbohydrate	0.0g	4.9g
Fat	16.8g	9.1g
Sodium	0.4g	0.4g
Fibre	0.0g	1.4g

Answer. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Praesent porttitor arcu luctus, imperdiet urna iaculis, mattis eros. Pellentesque iaculis odio vel nisl ullamcorper, nec faucibus ipsum molestie. Sed dictum nisl non aliquet porttitor. Etiam vulputate arcu dignissim, finibus sem et, viverra nisl. Aenean luctus congue massa, ut laoreet metus ornare in. Nunc fermentum nisi imperdiet lectus tincidunt vestibulum at ac elit. Nulla mattis nisl eu malesuada suscipit.

Question 5 (bonus marks)

Listing 1: Luftballons Perl Script

```
1 #!/usr/bin/perl
2
3 use strict;
4 use warnings;
5
6 for (1..99) { print $_." Luftballons\n"; }
7
8 # This is a commented line
9
10 my $string = "Hello World!";
11
12 print $string."\n\n";
13
14 $string =~ s/Hello/Goodbye Cruel/;
15
16 print $string."\n\n";
17
18 finale();
19
20 exit;
21
22 sub finale { print "Fin.\n"; }
```

1. How many luftballons will be output by the Listing 1 above?
2. Identify the regular expression in Listing 1 and explain how it relates to the anti-war sentiments found in the rest of the script.

Answer.

1. 99 luftballons.
2. Lorem ipsum dolor sit amet, consectetur adipiscing elit. Praesent porttitor arcu luctus, imperdiet urna iaculis, mattis eros. Pellentesque iaculis odio vel nisl ullamcorper, nec faucibus ipsum molestie. Sed dictum nisl non aliquet porttitor. Etiam vulputate arcu dignissim, finibus sem et, viverra nisl. Aenean luctus congue massa, ut laoreet metus ornare in. Nunc fermentum nisi imperdiet lectus tincidunt vestibulum at ac elit. Nulla mattis nisl eu malesuada suscipit.