Exam Computational Thinking

Course code: X_401098

Date: 06 January 2014

Time: 18.30-21.15u

Remarks

a) You are not allowed to use such devices as calculator, mobile, or similar.
b) Motivate your answer for each question.
c) Submit your exam questions and your answers to the supervisor.
d) You may answer the questions in Dutch or English.

Scoring

Question	Points
1a	5
1b	5
1c	5
2a	8
2b	5
3a	11
3b	5
4	10
5a	5
5b	11
5c	5
5d	10
5e	5
Presence	10

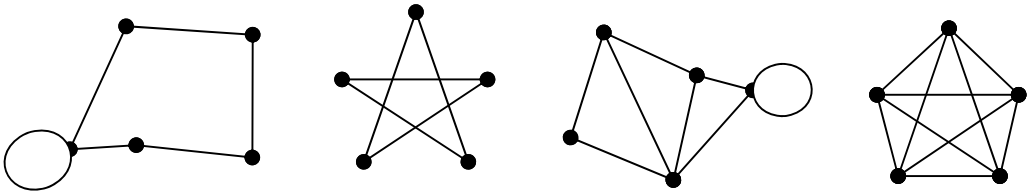
Grade = (total points) /10

Good luck!

1)

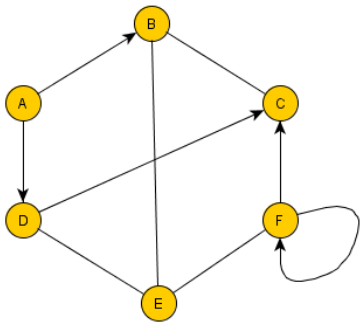
a) What is a complete graph?

b) Which of the following graph is a complete graph? Explain your answer.



A **B** **C** **D**

c) Explain why the following graph is not a connected graph.



2) Four people must cross a bridge in the dark. Only two people can cross the bridge at the same time. They only have one flashlight and they have to take the flashlight with them otherwise they will not be able to see anything in the dark. However, the batteries in the flashlight will be empty in 18 minutes. The flashlight must be brought back and forth. Everyone walks at different speeds: the persons 1, 2, 3, and 4 need successively 1, 2, 5, and 10 minutes to walk across the bridge. Two people walking together across the bridge need together as much as time as required by the slowest of the two.

a) How much time (in minutes) could it take for all the four people to cross the bridge? Explain your answer.

b) Explain which solution strategy you used?

3) Consider the following sequence.

4	15	26	36	38	48	55	76	77	88	90	92	101

a) Show how you search number 26 in the above sequence by using binary search.

b) Show that linear search is faster than binary search in this case.

4) Show by using merge sort how you can sort the following sequence.

3	9	6	7	5	4	1	8	2	10

5) Consider the following distance table.

	A	B	C	D	E	F
A	-	4	7	5	-	-
B	4	-	2	-	9	8
C	7	2	-	3	3	-
D	5	-	3	-	9	-
E	-	9	3	9	-	1
F	-	8	-	-	1	-

a) Name three properties of the graph that represents the distance table.
Motivate your answer.

b) Show by means of the Dijkstra's algorithm what the shortest path is from A to F.

c) Is there a second shortest path from A to F possible? If so, show the path.
Motivate your answer.

d) Determine the minimum spanning tree for the graph that is represented by the distance table?
Motivate your answer.

e) What is the weight of that minimum spanning tree?