

Graph Theory (Core)

Click on a question number to see how your answers were marked and, where available, full solutions.

Question Number	Score
Trees	
Question 1	3 / 3
Question 2	2 / 2
Euler Paths and Circuits	
Question 3	4 / 4
Question 4	4 / 4
Total	13 / 13 (100%)

Congratulations, you passed this quiz with a sufficient score. You may include this attempt as part of your self-assessment evidence.

Make sure that you click on "Print this results summary" and save to pdf, so that everything can be read clearly. Do not navigate away from this page before you have saved your result.

Performance Summary

Exam Name:	Graph Theory (Core)
Session ID:	01647905189
Exam Start:	Sun Apr 14 2024 16:09:38
Exam Stop:	Sun Apr 14 2024 16:26:14
Time Spent:	0:16:36

Question 1

Which of the following graphs are trees over the vertices $\{a, b, c, d, e, f\}$?

Please note that you will receive 1 mark for each correct answer and lose 1 mark for each incorrect one.

$[[a, d], [b, c], [b, d], [b, e], [c, e]]$

☐ True ☒ False

Expected answer:

☐ True ☒ False



$[[a, b], [c, a], [d, c], [e, c], [f, c]]$

☒ True ☐ False

Expected answer:

☒ True ☐ False



$[[a, e], [b, f], [e, f], [a, f], [b, c]]$

☐ True ☒ False

Expected answer:

☐ True ☒ False



Gap 0

✓ You chose a correct answer. You were awarded 1 mark.

Gap 1

✓ You chose a correct answer. You were awarded 1 mark.

Gap 2

- ✓ You chose a correct answer. You were awarded 1 mark.
- You scored 3 marks for this part.

Score: 3/3 ✓

Advice

1. The first graph is not a tree as it contains a loop.
2. The second graph is a tree.
3. The third graph is not a tree as it contains a loop.

Question 2

Find spanning trees for the following graphs over the vertices $\{a, b, c, d, e, f\}$. Enter your solution as the list of edges, using square brackets - such as $[[a,b],[c,d]]$.

First Graph

Enter a spanning tree for the graph with edges $[[a, f], [b, c], [b, e], [b, f], [c, d], [c, e], [c, f], [d, e]]$:

$[[a, f], [b, c], [c, d], [c, e], [c, f]]$

$[[a, f], [b, c], [c, d], [c, e], [c, f]]$ ✓

Expected answer:

$[[a, f], [f, b], [f, c], [c, d], [c, e]]$

- ✓ The graph you entered forms a spanning tree of the original graph. You were awarded 1 mark.
- You scored 1 mark for this part.

Score: 1/1 ✓

Second Graph

Enter a spanning tree for the graph with edges $[[a, d], [b, d], [b, e], [b, f], [c, d], [c, f], [d, f]]$:

$[[a, d], [b, e], [b, d], [c, d], [d, f]]$

$[[a, d], [b, e], [b, d], [c, d], [d, f]]$ ✓

Expected answer:

$[[a, d], [d, b], [d, c], [d, f], [b, e]]$

✓ The graph you entered forms a spanning tree of the original graph. You were awarded 1 mark.

You scored 1 mark for this part.

Score: 1/1 ✓

Advice

1. A possible spanning tree for the first graph is $[[a, f], [f, b], [f, c], [c, d], [c, e]]$.

2. A possible spanning tree for the second graph is $[[a, d], [d, b], [d, c], [d, f], [b, e]]$.

Question 3

Consider the following graphs over the vertices $\{a, b, c, d, e, f\}$.

Which of them contain Euler paths?

a)

$[c, a], [a, b], [a, d], [a, e], [a, f], [b, d], [b, f], [c, d], [c, e], [d, e], [d, f]$

- ☐ Contains a Euler path
 ☐ Contains a Euler Circuit
 ☐ Contains both
- ☒ Contains neither.



Expected answer:

- ☐ Contains a Euler path
 ☐ Contains a Euler Circuit
- ☐ Contains both
 ☒ Contains neither.

You chose a correct answer. You were awarded **2** marks.
 You scored **2** marks for this part.

Score: 2/2

b)

$[a, b], [a, c], [a, d], [a, e], [b, c], [b, d], [b, e], [b, f], [c, d], [d, e], [e, f]$

- ☒ Contains a Euler path
☐ Contains a Euler Circuit
 ☐ Contains both
- ☐ Contains neither.



Expected answer:

- ☒ Contains a Euler path
 ☐ Contains a Euler Circuit
- ☐ Contains both
 ☐ Contains neither.

You chose a correct answer. You were awarded **2** marks.
 You scored **2** marks for this part.

Advice

1. The degrees of the vertices in the first graph are $[5, 3, 3, 5, 3, 3]$. The number of vertices with an odd degree is 6. Since $6 \geq 2$, it doesn't contain Euler paths, Since $6 \neq 0$, it doesn't contain Euler circuits,
2. The degrees of the vertices in the first graph are $[4, 5, 3, 4, 4, 2]$. The number of vertices with an odd degree is 2. Since $2 \leq 2$, it contains Euler paths, Since $2 \neq 0$, it

Question 4

Consider the following graphs over the vertices $\{a, b, c, d, e, f\}$.

Which of them contain Euler paths?

a)

$[[a, c], [a, f], [b, c], [c, d], [c, e]]$

- ☐ Contains a Euler path
 ☐ Contains a Euler Circuit
 ☐ Contains both
- ☒ Contains neither.



Expected answer:

- ☐ Contains a Euler path
 ☐ Contains a Euler Circuit
- ☐ Contains both
 ☒ Contains neither.

✓ You chose a correct answer. You were awarded **2** marks.

You scored **2** marks for this part.

Score: 2/2 ✓

b)

$$[[a, c], [a, d], [a, e], [a, f], [b, c], [b, e], [c, e], [c, f], [d, e], [e, f]]$$

- ☒ Contains a Euler path
 ☐ Contains a Euler Circuit
 ☐ Contains both
☐ Contains neither.



Expected answer:

- ☒ Contains a Euler path
 ☐ Contains a Euler Circuit
☐ Contains both
 ☐ Contains neither.

✓ You chose a correct answer. You were awarded 2 marks.
 You scored 2 marks for this part.

Score: 2/2 ✓

Advice

1. The degrees of the vertices in the first graph are $[2, 1, 4, 1, 1, 1]$. The number of vertices with an odd degree is 4. Since $4 \geq 2$, it doesn't contain Euler paths, Since $4 \neq 0$, it doesn't contain Euler circuits,

2. The degrees of the vertices in the first graph are $[4, 2, 4, 2, 5, 3]$. The number of vertices with an odd degree is 2. Since $2 \leq 2$, it contains Euler paths, Since $2 \neq 0$, it doesn't contain Euler circuits,