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	1 / 2
Euler Paths and Circuits	
Question 3	4 / 4
Question 4	3 / 4
Total	**11 / 13 (84%)**

Please review your results carefully and make sure that you understand your mistakes before attempting it again.

If you keep failing this test, then you *must* come to class and go over your results with the teaching team. You can attempt the quiz while in class, and discuss your results with the tutors. Do *not* attempt to try to solve this quiz on your own without understanding your mistakes first. You will likely end up spending far more time than necessary on the module.

In other words, if you have failed this quiz several times already, you can keep trying to pass this quiz on your own, and possibly waste many hours doing so, or you can discuss your difficulties with the teachin staff and be done much quicker.

If you are an online student unable to come to class, then you you can either attend the help hub, or you can post a question in the forum. Consider including a screenshot of your attempts in the question, as well as your working out. We will help you narrow down where you went wrong.

You can include this attempt as part of your learning evidence, as well as your discussions with a tutor to understand your mistakes.

Performance Summary

Exam Name:	Graph Theory (Core)
Session ID:	15525412038
Exam Start:	Sat Apr 13 2024 19:34:54
Exam Stop:	Sat Apr 13 2024 19:50:31
Time Spent:	0:15:37

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, e], [b, c], [b, e], [c, e]]

○ True ◉ False

Expected answer:

○ True ◉ False

✔

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

◉ True ○ False

Expected answer:

◉ True ○ False

✔

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

○ 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 does not contain the expected number of edges.
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, b], [a, c], [a, d], [a, e], [a, f], [b, c], [c, d], [e, f]]:

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

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

Expected answer:

```
[ [ "a", "b" ], [ "a", "c" ], [ "a", "d" ], [ "a", "e" ], [ "a",
```

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

✖ Your graph is not a tree, as it contains loops.

You scored **0** marks for this part.

Score: 0/1 ✖

Second Graph

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

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

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

Expected answer:

```
[ [ "a", "b" ], [ "a", "c" ], [ "a", "d" ], [ "a", "e" ], [ "e",
```

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

✔ 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 $\left[\left[a, b\right], \left[a, c\right], \left[a, d\right], \left[a, e\right], \left[a, f\right]\right]$.

Question 3

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

Which of them contain Euler paths?

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a)

$\left[\left[e, d\right], \left[d, a\right], \left[a, b\right], \left[a, c\right], \left[b, f\right], \left[c, d\right], \left[c, f\right], \left[d, f\right], \left[e, f\right]\right]$

◉ 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)

$\left[\left[d, e\right], \left[a, b\right], \left[a, f\right], \left[b, d\right], \left[c, f\right], \left[d, f\right], \left[e, f\right]\right]$

◉ 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 $\left[3, 2, 3, 4, 2, 4\right]$. 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,

2. The degrees of the vertices in the first graph are $\left[2, 2, 1, 3, 2, 4\right]$. 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,

Question 4

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

Which of them contain Euler paths?

---

a)

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

◉ 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 **1** mark.

You scored **1** mark for this part.

Score: 1/2 ✔

b)

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

○ 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 ✔

Advice

1. The degrees of the vertices in the first graph are $[2, 4, 2, 4, 2, 2]$. The number of vertices with an odd degree is 0. Since $0 \leq 2$, it contains Euler paths, and since there are no odd-degree vertices, it also contains Euler circuits,

2. The degrees of the vertices in the first graph are $[4, 2, 2, 4, 4, 2]$. The number of vertices with an odd degree is 0. Since $0 \leq 2$, it contains Euler paths, and since there are no odd-degree vertices, it also contains Euler circuits,

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