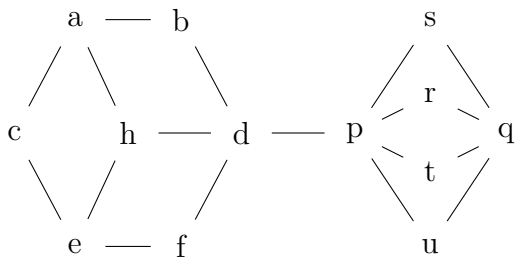
CS 173, Spring 2016
Examlet 6, Part B

NETID:

FIRST: | **LAST:**

Discussion: Monday 9 10 11 12 1 2 3 4 5

1. (9 points) How many paths are there from c to q in the graph below? Explain or show work.



Solution: Every path from c to q must go via the nodes d and p. There are 6 ways to get from c to d: cabd, cahd, cahefd, cefd, cehd, cehabd And then there are 4 ways to get from p to q. So there are a total of 24 paths from c to q.

2. (3 points) How many connected components does the above graph have?

Solution: One connected component

3. (3 points) Is the above graph acyclic? Briefly explain why or why not.

Solution: No, it's not acyclic. For example, cahe is a cycle.

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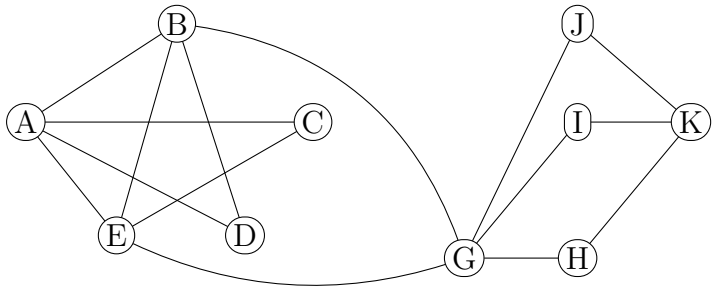
1. (9 points) How many paths are there from A to K in the graph below? Explain or show work.



Solution: There are 4 ways to get from A to G via B (ABG, ABEG, ADBG, ACEBG) and similarly 4 ways to get from A to G via E. There are then 3 paths from G to K. So a total of $8 \cdot 3 = 24$ paths.

2. (3 points) Does this graph have an Euler circuit? Briefly explain why or why not.

Solution: It cannot have an Euler circuit because G has odd degree.

3. (3 points) Does the above graph have a cut edge? Briefly explain why or why not.

Solution: No, it does not have a cut edge. Every node belongs to a cycle.

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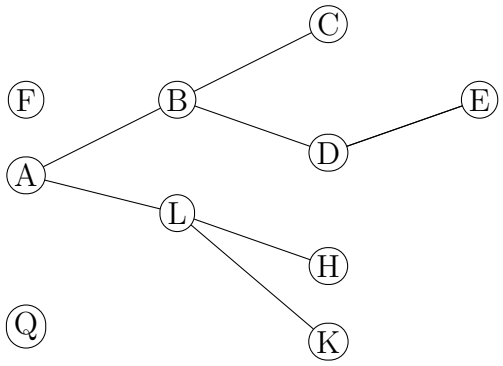
1. (9 points) How many paths are there (with any starting/ending points) in the graph below? Explain or show work.



Solution: There are two zero-length paths, one using just the node F and the other using just the node Q.

In the large component, if you pick any two nodes, there is exactly one path between them. Since there are 8 nodes, there are $8 \cdot 8 = 64$ paths.

So there are 66 paths total.

2. (3 points) How many connected components does the above graph have?

Solution: Three connected components.

3. (3 points) Is the above graph acyclic? Briefly explain why or why not.

Solution: Yes, it is acyclic (no cycles).

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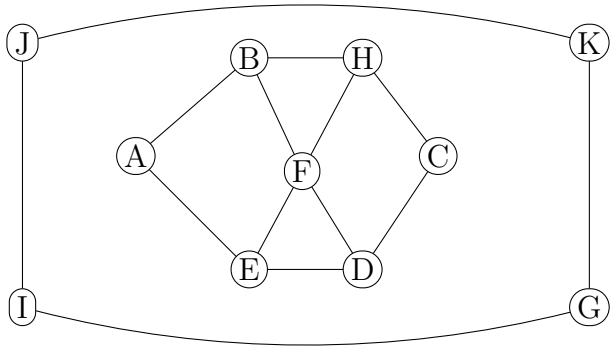
1. (9 points) How many paths are there from A to C in the graph below? Explain or show work.



Solution: A graph from A to C must go via B or E. There are six ways to get from B to C: BHC, BHFDC, BHFEDC, BFHC, BFDC, BFEDC. Similarly, there are six ways to get from E to C. So there are 12 paths total from A to C.

2. (3 points) How many connected components does the above graph have?

Solution: Two connected components.

3. (3 points) Is this graph bipartite? Briefly justify your answer.

Solution: This graph is not bipartite because it contains triangles such as BFH.

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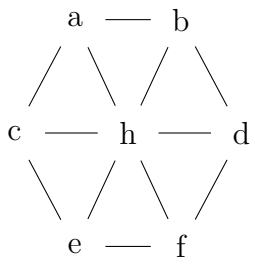
1. (9 points) How many paths are there from h to d in the graph below? Explain or show work.



Solution: A path from h to d must go from h to one of the rim nodes, then (since it can't return to h) walk along the rim to d. There are 11 possible paths: HD, HBD, HBACEFD, HABD, HACEFD, HCABD, HCEFD, HEFD, HECABD, HFD, HFECAB.

2. (3 points) What is the diameter of this graph?

Solution: The diameter is 2. You can get between any pair of rim nodes in two steps by going via h.

3. (3 points) Does this graph contain a 6-node cycle? Briefly justify your answer

Solution: Yes, the cycle A, B, D, F, E, C.

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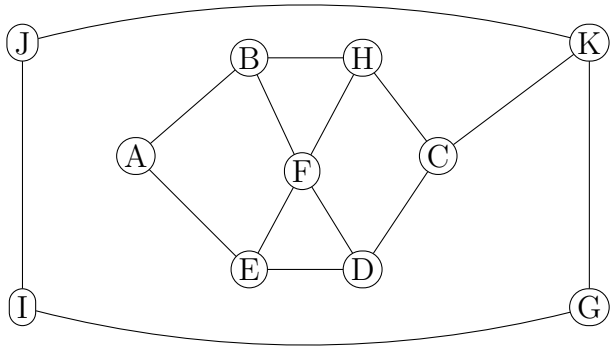
1. (9 points) How many paths are there from A to I in the graph below? Explain or show work.



Solution: A graph from A to C must go via B or E. There are six ways to get from B to C: BHC, BHFDC, BHFEDC, BFHC, BFDC, BFEDC. Similarly, there are six ways to get from E to C. So there are 12 paths total from A to C.

Then there are two ways to get from C to I.

So there are a total of 24 paths from A to I.

2. (3 points) How many connected components does the above graph have?

Solution: One connected component.

3. (3 points) Does the above graph have a cut edge? Briefly explain why or why not.

Solution: Yes. CK is a cut edge because removing it separates the graph into two connected components.