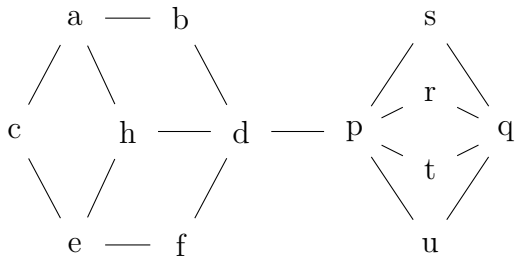
CS 173, Fall 17 Examlet 6, Part B

Name:_____

NetID:_____ **Lecture: A B**

Discussion: Thursday Friday 9 10 11 12 1 2 3 4 5 6

(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 points) Is the above graph acyclic?

Solution: No

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

Solution: One

(2 points) Does the above graph contain a 5-node cycle?

Solution: No

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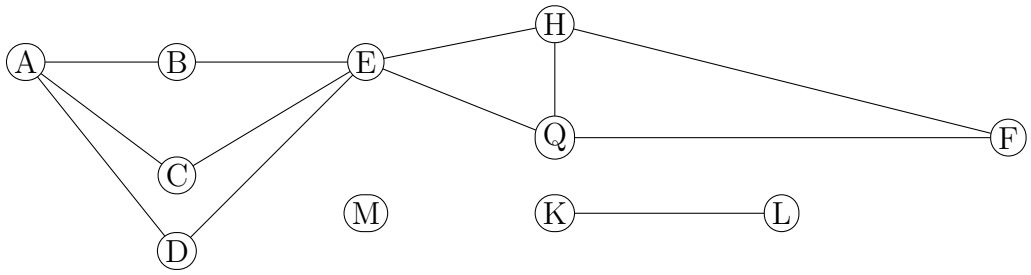
(9 points) How many paths are there from A to F in the graph below? Explain or show work.



Solution: There are three ways to get from A to E. There are four ways to get from E to F. So there are $3 \cdot 4 = 12$ paths total.

(2 points) Does the above graph contain a 5-node cycle?

Solution: No

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

Solution: Three

(2 points) Does the above graph have an Euler circuit?

Solution: No

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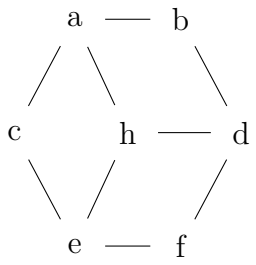
(9 points) How many cycle subgraphs (i.e. subgraphs isomorphic to C_n for some n) does the graph below contain? Count two cycles as the same if they have the same set of nodes and the same set of edges. Don't worry about which node is the start/end node. Briefly justify and/or show work.



Solution: There are three cycles with 4 nodes: cahec, bdhab, and fdhef. Then there are 4 cycles with 6 nodes: abdfeca, abdfeha, dfecahd, ehdbace.

(2 points) Does the above graph have an Euler circuit?

Solution: No

(2 points) Is the above graph bipartite?

Solution: Yes

(2 points) Does the above graph contain a 4-node cycle?

Solution: Yes

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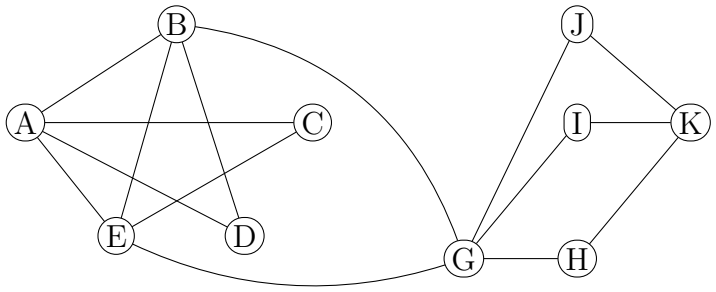
(9 points) How many paths are there from A to K in the graph below? Explain or show work.



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 points) Does the above graph contain a 5-node cycle?

Solution: Yes

(2 points) What is the diameter of the above graph?

Solution: Four

(2 points) Is the above graph bipartite?

Solution: No

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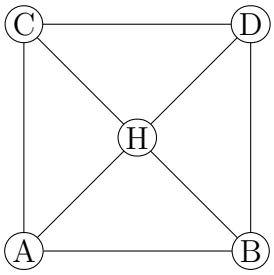
(9 points) How many paths are there from B to C in the graph below? Explain or show work.



Solution: There are 9 paths. Starting with BH: BHC, BHDC, BHAC. Starting with BA: BAC, BAHC, BAHDC. Starting with BD: BDC, BDHC, BDHAC.

(2 points) Is the above graph acyclic?

Solution: No

(2 points) Does the above graph have a cut edge?

Solution: No

(2 points) What is the diameter of the above graph?

Solution: 2

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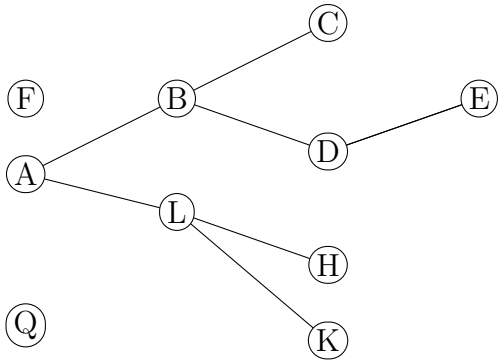
(9 points) How many paths are there in the graph below? Consider all choices of start and end nodes. Explain or show work.



Solution: There are two zero-length paths not in the large component: 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 points) How many connected components does the above graph have?

Solution: Three

(2 points) Is the above graph bipartite?

Solution: Yes

(2 points) Does the above graph contain a 4-node cycle?

Solution: No