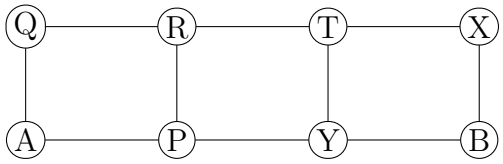
CS 173, Fall 2016
Examlet 6, Part B

NETID:

FIRST:	LAST:

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

(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; don't worry about (for example) which node is the start/end node. Briefly justify and/or show work.



Solution: There is one cycle containing all 8 nodes. There are two cycles containing 6 nodes. And there are three cycles containing only 4 nodes. So there are a total of 6 cycles.

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

Solution: One

(2 points) Is the above graph bipartite?

Solution: Yes

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

Solution: No

CS 173, Fall 2016
Examlet 6, Part B

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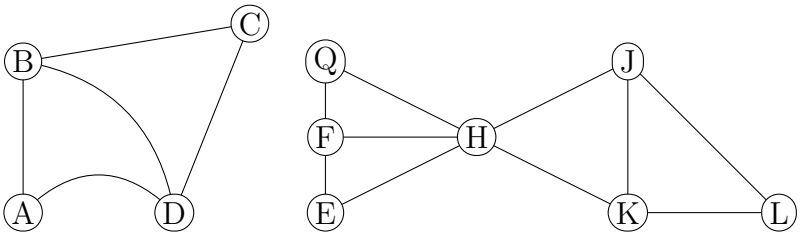
Discussion: Thursday 2 3 4 5 Friday 9 10 11 12 1 2

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



Solution: There are three paths from Q to H. Then four paths from H to L. So 12 paths total.

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

Solution: Two

(2 points) Is the above graph acyclic?

Solution: No

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

Solution: No

CS 173, Fall 2016
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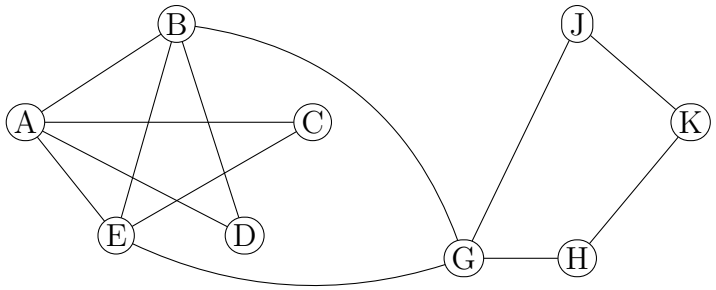
(9 points) How many paths are there from C to K in the graph below? Explain or show work.



Solution: There are eight ways to get from C to G. The path has to start by going to A or E. Going first to A gives us paths via AB, AE, AEB, ABE, ADB, and ADBE. Going first to E gives us paths via E, EB, EAB, and EADB.

Then there are two ways to get from G to K.

So there are a total of $10 \cdot 2 = 20$ paths from C to K.

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

Solution: Yes (ABBJKHGEBDACEA)

(2 points) Is the above graph bipartite?

Solution: No

(2 points) Does the above graph contain a 6-node cycle?

Solution: Yes (GBDACEG)

CS 173, Fall 2016
Examlet 6, Part B

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FIRST:	LAST:

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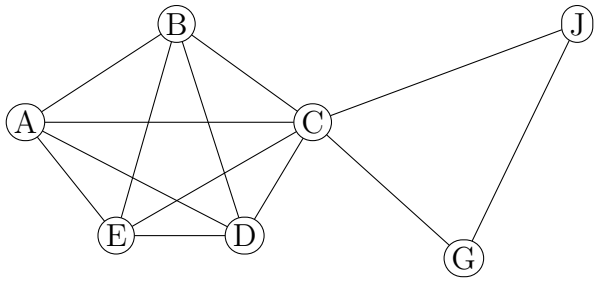
(9 points) How many paths are there from A to C in the graph below? Explain or show work.



Solution: A path from A to C can't include G or J, because it would need to repeat the node C.

Since the lefthand part of the graph has edges between any pair of nodes, the path can go direct via any combination of the nodes B, D, and E. There is one path with none of these nodes, three with a single node (B, C, or D), six with two nodes (BE, BD, EB, ED, DB, DE), and six with three intermediate nodes (BED, BDE, EBD, EDB, DBE, or DEB). So there are a total of 16 paths.

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

Solution: Yes (CJGCDEABCEBDAC)

(2 points) Is the above graph bipartite?

Solution: No

(2 points) Does the above graph contain a 6-node cycle?

Solution: No

CS 173, Fall 2016
Examlet 6, Part B

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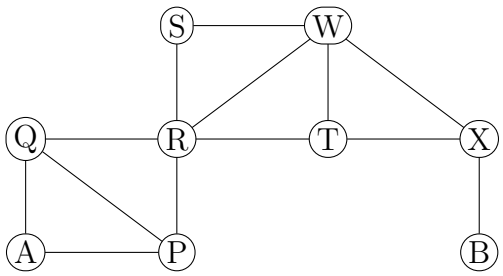
Discussion: Thursday 2 3 4 5 Friday 9 10 11 12 1 2

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



Solution: There are four ways to get from A to R. Then there are six ways to get from R to X: RSWX, RSWTX, RWX, RWTX, RTWX, RTX. And then there is only one way to get from X to B. So there are a total of $4 \cdot 6 = 24$ paths from A to B.

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

Solution: One

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

Solution: Five

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

Solution: Yes

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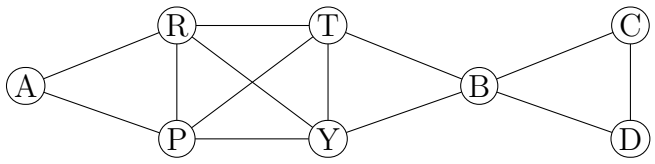
(9 points) How many paths are there from A to C in the graph below? Explain or show work.



Solution: Suppose we go first to node R. We can continue to B via the following 10 sequences of nodes: T, Y, TY, YT, PT, PY, PTY, PYT, TPY, YPT. If, instead, we first go to P, there is a similar set of 10 ways to reach B. So there are a total of 20 ways to get from A to B. And then two ways to get from B to C. So there are a total of 40 paths.

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

Solution: One

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

Solution: No

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

Solution: Yes (ARTBCDBYTPYRPA)