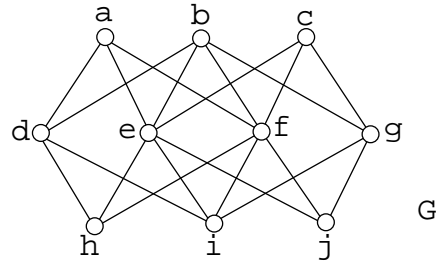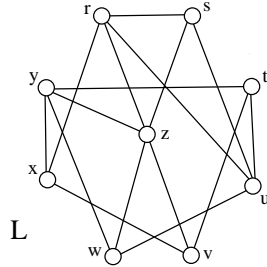This assignment is just basic skills. After this we will go back to the typical assignment format. Complete all of the questions.

Question 1. Find a Hamiltonian cycle in the graphs below, or give a *convincing* reason why there isn't one. (Note that trying really hard and not finding one isn't convincing.)

Question 2. True or false, and defend your answer: Every 6-regular graph of order 10 has a Hamiltonian cycle.
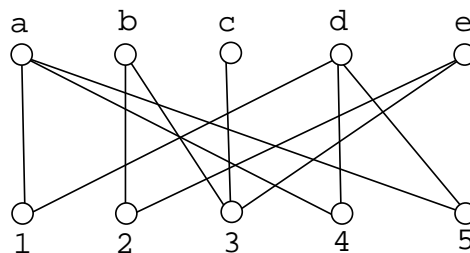
Question 3. In the graphs below, find $\alpha(G)$, $\beta(G)$, and $\alpha'(G)$ and $\beta'(G)$. Justify that your answer is correct.
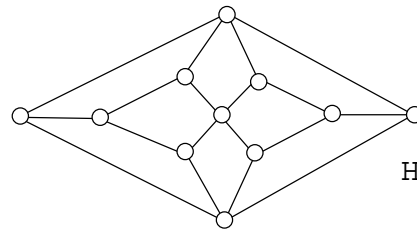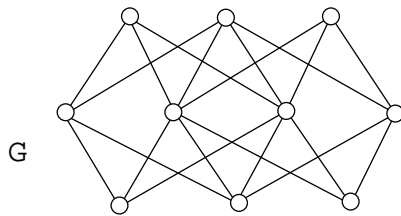
Question 4. In the graph on the left above, find a maximal matching that is not a maximum matching.

Question 5. Draw a graph of order at least 6 in which $\alpha'(G) = \alpha(G)$.

Question 6. Does the graph below have a perfect matching? Defend your answer.

Question 7. Read about systems of distinct representatives, from the bottom of page 187 through the statement of Theorem 8.4. Then determine whether the set systems below have a system of distinct representatives. If so, find it. If not, use Theorem 8.4 to argue why not.

(a) $S_1 = \{BEH\}$, $S_2 = \{CFG\}$, $S_3 = \{BDE\}$, $S_4 = \{AEH\}$, $S_5 = \{ACG\}$, $S6 = \{BDH\}$,
$S_7 = \{ABE\}$, $S_8 = \{ADH\}$

(b) $S_1 = \{ABE\}$, $S_2 = \{BCF\}$, $S_3 = \{CEF\}$, $S_4 = \{ADE\}$, $S_5 = \{ACD\}$, $S_6 = \{BDF\}$

Question 8. Complete exercise 6.12 in the textbook (no formal proof required).

Questions 9. Complete exercise 8.2 in your textbook.