

- 1.) (i) Using Euler's theorem, determine if a given graph has an Euler circuit. Find one Euler circuit starting at a specified vertex. (Reference: See Quiz 1.)
(ii) Give and explain at least one real world example where Euler circuits are used (see pages 3 and 4 of the book).
(iii) Carefully state Euler's Theorem.
- 2.) Explain the background of the Königsberg bridge problem, draw the corresponding graph, and state the main question. Using Euler's theorem explain the answer to the main question. (Reference: See the handout given in class and class notes.)
- 3.) Describe the notion of "greedy algorithm." Briefly discuss the advantages and disadvantages of nearest neighbor algorithm and sorted edges algorithm. (Reference: Carefully read Section 2.3.)
- 4.) Solve a Traveling Salesman Problem using nearest neighbor algorithm. (Reference: Section 2.3 of the book.)
- 5.) Solve a Traveling Salesman Problem using sorted edges algorithm. (Reference: Reference: Section 2.3 of the book.)
- 6.) (i) Counting Problem (Reference: examples given in class, especially counting license plates and palindromes; problems 23, 25, 27 on page 68 of the book.); (ii) Explain why it is important to study counting techniques.
- 7.) (i) Find Minimum-Cost Spanning Tree using Kruskal's procedure. (Reference: example given in class; Question 51 on page 72.); (ii) Give and explain at least one real-world example in which minimum-cost spanning trees are useful. (Reference: Carefully read Section 2.3; consult class notes.); (iii) given a graph, determine if the graph is a tree.
- 8.) Explain the background of knight's tour problem on 8×8 chessboard. State the main question in ordinary language. Next, state the question in graph theoretic terms (refer to Hamiltonian circuits), and give names of two mathematicians who solved this problem. (Reference: See the handout given in class and class notes.)
- 9.) Give short biographical sketches of Euler and Hamilton. Though exact years are not overly important, make sure you that place Euler and Hamilton in appropriate centuries and that you mention problems/puzzles studied in class that Euler and Hamilton worked on. (Reference: See the handouts given in class; see Spotlight 1.1 on page 7 of the book.)