

01. Briefly explain what is ICMP in TCP/IP protocol? (3%) In many operating systems, there is a “Traceroute” program which allows us to trace a routing-path from a host to any host. “Traceroute” is implemented with ICMP messages. Please show the answer how it works. (7%)
02. Assume that there are 8 numbers (16, 22, 6, 41, 33, 16, 3, 30) to be sorted with the order of decreasing. Show the answer by using **heap sort algorithm**. (7%) Is heap sort algorithm a stable sorting algorithm? Why? (3%)
03. If the postorder “ABCDIHGFE” and inorder “EAFBGDCHI” determine the **same binary tree**? Show the tree. (6%) What are the **breadth-first** and **depth-first** traversals of this tree? (4%)
04. Briefly explain following terms:
1. “Circuit switching”, “Message switching” and “Packet switching”. (6%)
 2. “Baud rate” and “bps”. (4%)
 3. “Critical-Section” and “Semaphores” (4%)
05. Briefly explain the following object-oriented terms:
1. Polymorphism (4%)
 2. Encapsulation (2%)
 3. Override (2%)
 4. Overload (2%)
06. Describe why a comparison-based sorting algorithm for any data has the best complexity of $O(n \log n)$? (6%)
07. Why is spooling necessary for multiprogramming? (5%) Why deadlocks may occur in a spooling system and how to prevent this type of deadlock? (5%)
08. What’s the difference between symmetric key and asymmetric key? (4%) Explain what is SSL in WWW communication? How does it work? (4%) What is the disadvantage of SSL? (2%)
09. What is context switch? (3%) What cause context switch? (3%) Describe the concept of working set model in virtual memory management. (4%)
10. Design a recursive procedure to list (print) all possible rearrangements of the symbols in a string of n distinct characters. (10%) You can use C, C++, Basic, Java or Pascal language.