

KATHMANDU UNIVERSITY  
End Semester Examination  
February/March, 2018

Marks Scored:

Level : B.E./B.Sc.  
Year : II

Course : COMP 202  
Semester: I

Exam Roll No.:

Time: 30 mins.

F.M. : 10

Registration No.:

Date

MAR 07 2018

SECTION "A"  
[20 Q.×0.5=10 marks]

Circle the most appropriate answer.

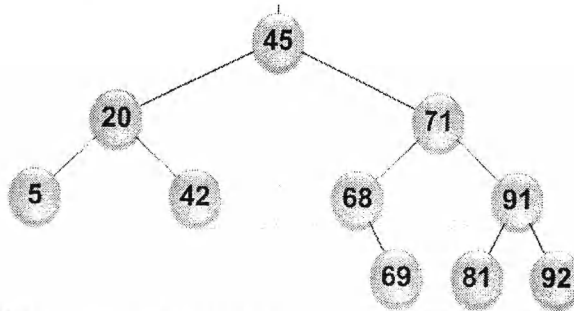


Figure 1: A Binary Tree

Consider the above Figure 1: A Binary Tree to answer the questions 1, 2, 3, and 4.

- Which of the following statements is TRUE?
  - The given binary tree is a strictly binary tree.
  - Node 68 is a non-leaf node.
  - The given binary tree is a max heap tree.
  - The given binary tree is almost complete binary tree.
- If given binary tree were a complete binary tree with same height, how many internal nodes, also called non-leaf would have been there in a binary tree?
  - 5
  - 7
  - 8
  - 9
- If you want to insert new node 49, where does it go in the given binary search tree?
  - On the left of node 5
  - On the right of node 5
  - On the left of node 68
  - On the right of node 68
- What is the output of In-Order traversal over the given Binary Tree?
  - 5 20 42 45 68 69 71 81 91 92
  - 5 42 20 68 69 81 92 91 71 45
  - 45 5 20 42 71 68 69 91 81 92
  - None of the above
- Which of the following sorting algorithms does not require  $O(n^2)$  steps in worst case?
  - Insertion sort
  - Selection Sort
  - Heap Sort
  - Quick Sort
- Which of the following data structures is a linear data structure?
  - Arrays
  - Binary Search Tree
  - Directed Graph
  - Heap Tree



Consider the graph given below (Figure 2) to answer questions from 15 to 19.

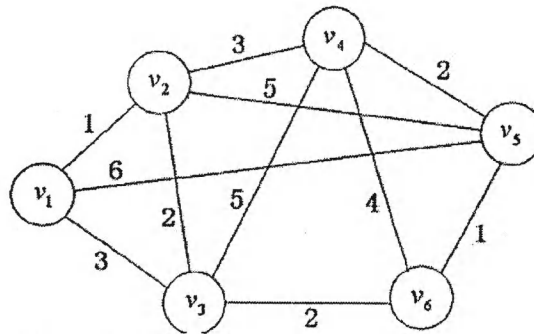
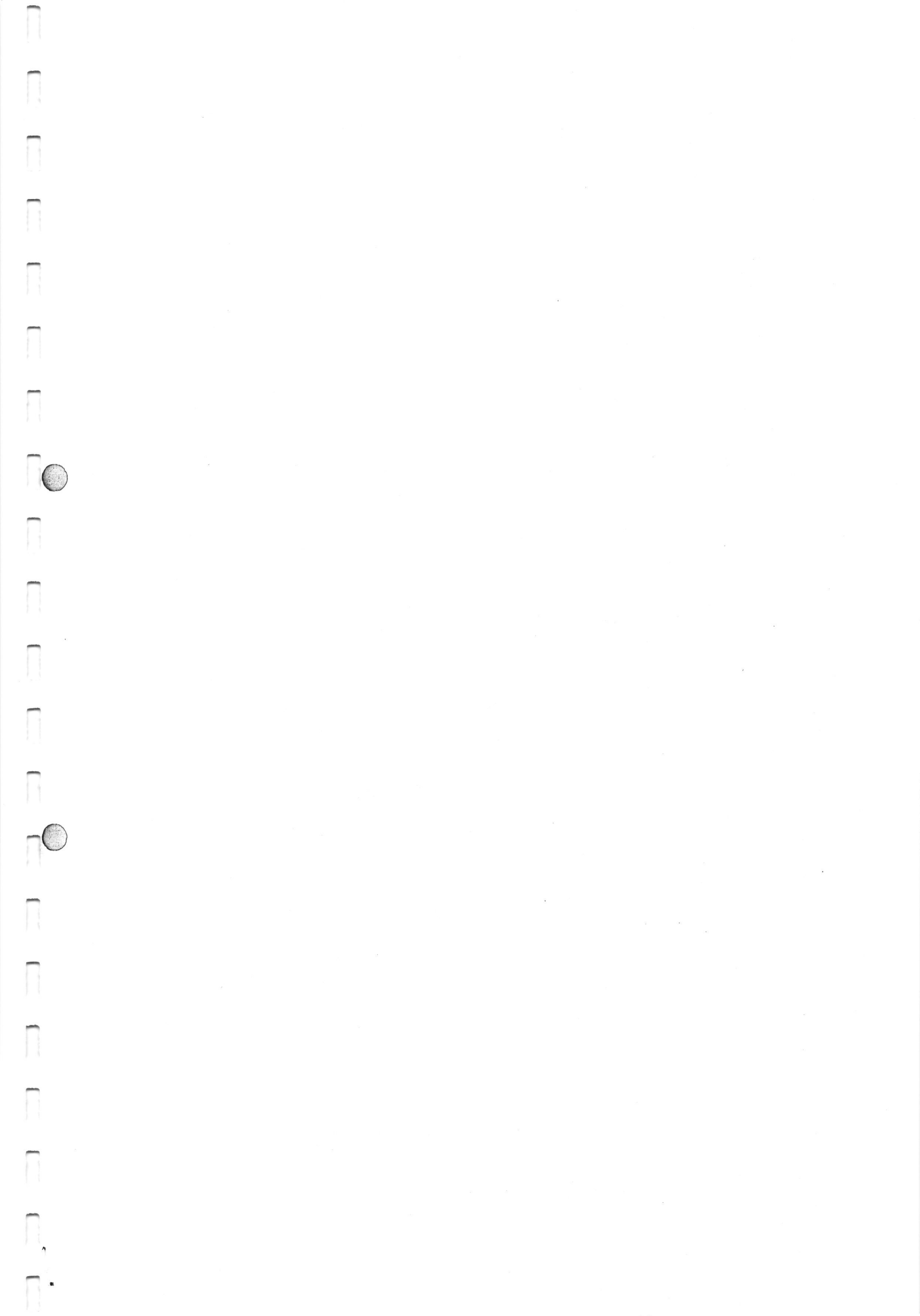


Figure 2: A graph

15. Refer to Figure 2. Which of the followings is TRUE about this graph?
  - a) It is an undirected graph multistage graph
  - b) It is a directed graph
  - c) It is no cycle
  - d) It is an undirected weighted graph
16. Refer to Figure 2. What is the weight of the minimum spanning tree?
  - a) 11
  - b) 8
  - c) 10
  - s) 7
17. Refer to Figure 2. What is the result of DFS procedure?
  - a) v1 v2 v3 v4 v5 v6
  - b) v1 v4 v2 v5 v3 v6
  - c) v1 v6 v2 v3 v4 v5
  - d) v1 v2 v3 v5 v4 v6
18. Refer to Figure 2. What is the result of BFS procedure?
  - a) v1 v2 v3 v5 v4 v6
  - b) v2 v3 v4 v5 v6 v1
  - c) v1 v2 v3 v4 v6 v5
  - d) v3 v5 v1 v2 v4 v6
19. Refer to Figure 2. If minimum spanning tree is produced, which of the following edge is NOT included?
  - a) (v1, v2)
  - b) (v3, v6)
  - c) (v4, v5)
  - d) (v2, v5)
20. Consider a hash table of size 13 that uses open addressing with linear probing. Let  $h(k) = k \bmod 13$  be a hash function used. A sequence of records with keys 22 54 13 67 44 86 28 is inserted into an initially empty hash table, the bins of which are indexed from 0 to 12. What is the index of the bin into which the last record is inserted?
  - a) 2
  - b) 3
  - c) 4
  - d) 5



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SECTION "B"  
[6 Q.×4=24 marks]

Attempt any *SIX* questions.

1. Write an algorithm to find the sum and average of 10 numbers stored in an Array? Analyze your algorithm and discuss the complexity of your algorithm. [2 + 2]
2. What do you mean by Queue ADT? Consider an array based priority queue. Write pseudo-codes for enqueue and dequeue operations. [1 + 3]
3. Differentiate between Singly Linked List and Doubly Linked List? What are the advantages of implementing Linked List over Array-based implementation? [3+1]
4. What is Collision Resolution Techniques? What are the advantages that open addressing hashing techniques have over separate chaining? [2+2]
5. Briefly explain what a binary search tree is, listing its properties. Starting with an initially empty BST, show what happens as the following elements are inserted in the given order: 50, 70, 30, 10, 20, 15. [2+2]
6. What do you mean by Graph ADT? Consider a graph given in Question 12. What is the output produced if you traverse it using DFS and BFS algorithms? [1+3]
7. Describe the best case scenario of Insertion Sort algorithm with suitable example.

SECTION "C"  
[2 Q. × 8 = 16 marks]

Attempt any *TWO* questions.

8. Discuss the importance of Stack ADT. Write an algorithm to evaluate the postfix expression. Trace the algorithm using one example and show the stack contents. [2+3+3]
9. Give an algorithm for Quick Sort and explain its time complexity. Trace the algorithm for the following data: [4+4]  
65 70 75 80 85 60 55 50 45

10. Consider a following undirected graph. Show how Krushkal's and Prim's algorithms are applied to find the minimum spanning tree. [4+4]

