

KATHMANDU UNIVERSITY  
End Semester Examination  
August, 2018

Marks Scored:

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

Course : COMP 314  
Semester: II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date **AUG 12 2018**

SECTION "A"

[20 Q.  $\times$  0.5 = 10 marks]

Circle the most appropriate answer.

1. To sort a list with  $n$  elements, the insertion sort begins with the \_\_\_\_\_ element.  
a. First                      b. Second                      c. Third                      d. Fourth
2. List obtained in third pass of selection sort for list 3, 5, 4, 1, 2 is \_\_\_\_\_  
a. 1, 2, 4, 3, 5              b. 1, 2, 3, 4, 5              c. 1, 5, 4, 3, 2              d. 3, 5, 4, 1, 2
3. Which of the following has search efficiency of  $O(1)$ ?  
a. Tree                      b. Heap                      c. Hash table                      d. Linked-list
4. Which of the following does not divide the list?  
a. Linear search              b. Binary search              c. Merge sort                      d. Quick sort
5. Time required to merge two sorted lists of size  $m$  and  $n$ , is  
a.  $O(m | n)$                       b.  $O(m + n)$                       c.  $O(m \log n)$                       d.  $O(n \log m)$
6. Quick sort algorithm is an example of:  
a. Greedy approach                      b. Improved binary search  
c. Dynamic Programming                      d. Divide and Conquer
7. Which of the following is not internal sort?  
a. Insertion sort              b. Bubble sort                      c. Merge sort                      d. Heap sort
8. If  $h$  is any hashing function and is used to hash  $n$  keys in to a table of size  $m$ , where  $n \leq m$ , the expected number of collisions involving a particular key  $x$  is :  
a. Less than 1                      b. Less than  $n$                       c. Less than  $m$                       d. Less than  $n/2$
9. A technique for direct search is:  
a. Binary Search              b. Linear Search                      c. Tree Search                      d. Hashing
10. Which of the following finds the largest element in the array, and puts it in the proper place?  
a. Selection sort              b. Insertion sort                      c. Quick sort                      d. None of the above
11. To perform the heap sort, you need to create a tree with all nodes greater than their:  
a. Sibling                      b. Children                      c. Parents                      d. None of the above



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Year : III  
Time : 2 hrs. 30 mins.

Course : COMP 314  
Semester: II  
F. M. : 40

SECTION "B"

[4 Q. × 5 = 20 marks]

Attempt *ANY FOUR* questions.

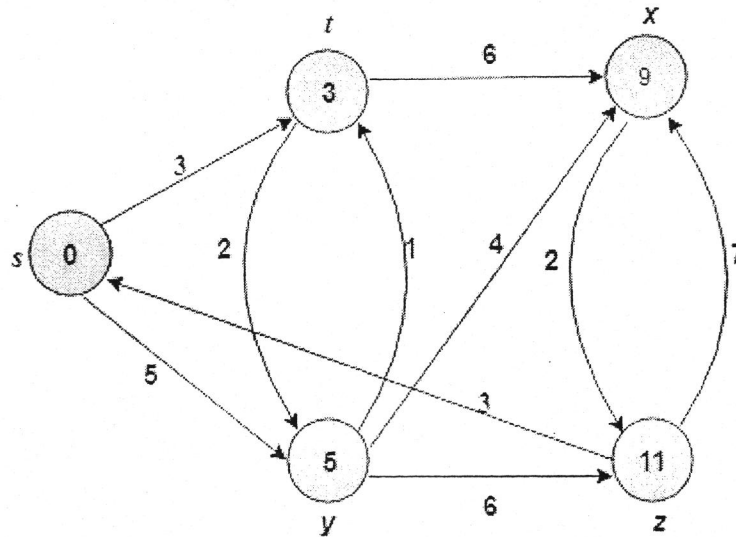
1. Suppose we are comparing implementations of insertion sort and merge sort on the same machine. For inputs of size  $n$ , insertion sort runs in  $8n^2$  steps, while merge sort runs in  $64n \log n$  steps. For which values of  $n$  does insertion sort beat merge sort? [5]
2. Demonstrate what happens when we insert the keys 5, 28, 19, 15, 20, 33, 12, 17, 10 into a hash table with collisions resolved by chaining. Let the table have 9 slots and let the hash function be  $h(k) = k \bmod 9$ . [5]
3. Briefly explain the Longest Common Subsequence (LCS) problem. Determine an LCS of  $\langle 1,0,0,1,0,1,0,1 \rangle$  and  $\langle 0,1,0,1,1,0,1,1,0 \rangle$  [5]
4. Compare the different working mechanisms of Kruskal and Prim's algorithm to build a Minimum Spanning Tree out of a given weighted undirected graph. [5]
5. Explain the greedy strategy employed by the Knapsack Problem. [5]

SECTION "C"

[2 Q. × 10 = 20 marks]

Attempt *ANY TWO* questions.

6. Explain the working mechanism of Dijkstra's algorithm. What is relaxation? Shade the edges that form a shortest-path tree rooted at the source  $s$  in the figure below. [5 + 5 = 10]



7. Write short notes on

[2 × 5 = 10]

- a. Least-cost search algorithm in the 8-puzzle problem.
- b. Red black tree and its properties

8. Explain the terminologies – Flow networks, residual networks, augmenting paths.

Given the cut(S, T) with  $S = \{s, v_1, v_2\}$  and  $T = \{v_3, v_4, t\}$ , calculate the net flow across (S, T) and the capacity  $c(S, T)$  in the figure below.

[5+5 = 10]

