Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination [C]
June, 2018

Level : B. Sc.
Year : III
Course : COMP 314
Semester : II

Exam Roll No. :
Time: 30 mins.
F. M. : 10

Registration No.:
Date JUN 10 2018

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Circle the most appropriate answer.

1. Given an empty stack, after performing push (1), push (2), Pop, push (3), push (4), Pop, Pop, push (5), Pop, what is the value of the top of the stack?
   a) 4 b) 3 c) 2 d) 1

2. Suppose there are log n sorted lists of n log n elements each. The time complexity of producing a sorted list of all these elements is (use heap data structure).
   a) O(n log log n) b) Θ (n log n) c) Ω(n log n) d) $\Omega(n^3/2)$

3. Which of the following asymptotic notation is the worst among all?
   a) O(n+9378) b) $O(n^3)$ c) $n^{O(1)}$ d) $2^{O(n)}$

4. Maximum degree of any vertex in a simple graph of vertices n is:
   a) 2n -1 b) n c) n+1 d) n-1

5. How many swaps are required to sort the given array using bubble sort {2, 5, 1, 3, 4}?
   a) 4 b) 5 c) 6 d) 7

6. The following sorting algorithms maintain two sub-lists, one sorted and one to be sorted3
   a) Selection Sort b) Insertion Sort c) Merge Sort d) Both "a" & "b"

7. In a min-heap:
   a) Parent nodes have values greater than or equal to their children
   b) Parent nodes have values less than or equal to their children
   c) Both statements are true
   d) Both statements are wrong

8. _____ is very useful in situation when data have to be stored and then retrieved in reverse order.
   a) Stack b) Queue c) List d) Link list

9. Which of the following data structure can't store the non-homogeneous data elements?
   a) Arrays b) Records c) Pointers d) Stacks

10. Which data structure is used in breadth first search of a graph to hold nodes?
    a) Stack b) Queue c) Tree d) Array

11. To represent hierarchical relationship between elements, which data structure is suitable?
a) Dequeue b) Priority queue c) Tree d) Graph

12. The number of comparisons done by sequential search is:
a) (N/2)+1 b) (N+1)/2 c) (N-1)/2 d) (N+2)/2

13. In general, the binary search method needs more than _____ comparisons.
a) $[\log_2 n]-1$ b) $[\log n] + 1$ c) $[\log_2 n]$ d) $[\log_2 n]+1$

14. What are the two things in order to successfully use the dynamic programming technique?
a) Optimal substructure and overlapping subproblems
b) A problem that can't be subdivided and is complex
c) Non-overlapping subproblems and intervals
d) Recursion and a problem that is complex

15. Which of the following standard algorithms is not a Greedy algorithm?
a) Dijkstra's shortest path algorithm
b) Prim's algorithm
c) Kruskal's algorithm
d) Bellman Ford Shortest path algorithm

16. What is the time complexity of Huffman Coding?
a) O(n) b) O(n log n) c) $O(n (\log n)^2)$ d) $O(n^2)$

17. Which of the following problems is a typical example of Dynamic Programming problem?
a) Activity Selection Problem
b) Longest Common Subsequence
c) Huffman coding
d) Merge Sort

18. Suppose you place m items in a hash table with an array size s. What is the correct formula for the load factor?
a) s – m b) s + m c) m*s d) m/s

19. When the entries 7, 4, 6, 1, 2, 3, 8, 5 are successively inserted into an initially empty binary search tree, what is the height of the resulting tree?
a) 4 b) 5 c) 2 d) 3

20. Relaxation for single source shortest path problem refers to _____
a) Updating $\Pi[v]$
b) Trying to find shorter paths than the one discovered so far.
c) Updating the d[v]
d) All of the above

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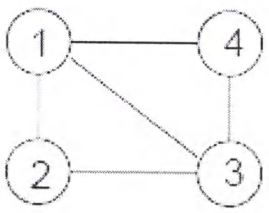
SECTION "B"
[4 Q. × 5 = 20 marks]

Attempt ***ANY FOUR*** questions.

1. Give the big-O performance of the following code fragment:
```
for i in range(n) :
k = 2 + 2
for j in range(n) :
k = 2 + 2
for k in range (n) :
k= 2 +2
```
Provide justification of your answer.

2. Draw the binary search tree that results from inserting the following keys in the order given: 68,88,61,89,94,50,4,76,66, and 82.

3. Provide adjacency matrix and adjacency list representations for the following undirected graph.



4. Provide a Dynamic Programming formulation of the Longest Common Subsequence Problem.

5. Explain the greedy strategy employed by the Activity Scheduling Problem.

SECTION "C"
[2 Q. × 10 = 20 marks]

Attempt ***ANY TWO*** questions.

6. Define Longest Common Subsequence with a suitable example.
Given two sequences X = <BACDB> and Y = <BDCB>, determine the LCS and the length of the LCS. Build a LCS table and store solutions in the table. [5+5]

7. Write short notes on [2Q. × 5 = 10 marks]
   a) Backtracking and the N-queens problem.
   b) Flow networks, augmenting paths, residual networks.

8. Explain Depth-First Search Traversal method and its working mechanism. Apply DFS in the following topological sort problem. Show the final order of dressing. [5+5]