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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E **Semester: IV**
Branch: Information Science and Engineering **Duration: 3 hrs.**
Course Code: 19IS4PCADA **Max Marks: 100**
Course: Analysis and Design of Algorithms **Date: 12.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Suppose you have algorithms with the five running times listed below. (Assume these are the exact running times.) How much slower do each of these algorithms get when you (a) double the input size, or (b) increase the input size by one? **06**

i) n^3
ii) $100n^2$
iii) n log n

b) With the help of a flowchart, explain what are the steps that need to be followed while designing and analyzing an algorithm. **08**

c) Consider the following algorithm. **06**

ALGORITHM Secret(A[0...n-1])
//Input: An array A[0...n-1] of n real numbers
minval←A[0]; maxval←A[0]
for i ←1 to n-1 do
if A[i]< minval
minval←A[i]
if A[i]> maxval
maxval←A[i]
return maxval-minval

i) What does this algorithm compute?
ii) What is its basic operation?
iii) How many times is the basic operation executed?
iv) What is the efficiency class of this algorithm?

UNIT - II

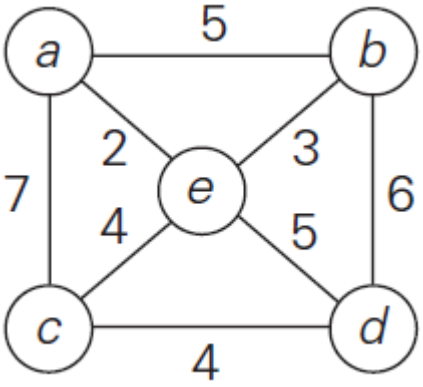
2 a) Write the quick sort algorithm. Apply the same to sort the list {E, X, A, M, P, L, E} in alphabetical order. **12**

b) Is selection sort stable? Yes/No. Validate your answer. Sort the list {E, X, A, M, P, L, E} in alphabetical order by selection sort. **08**

OR

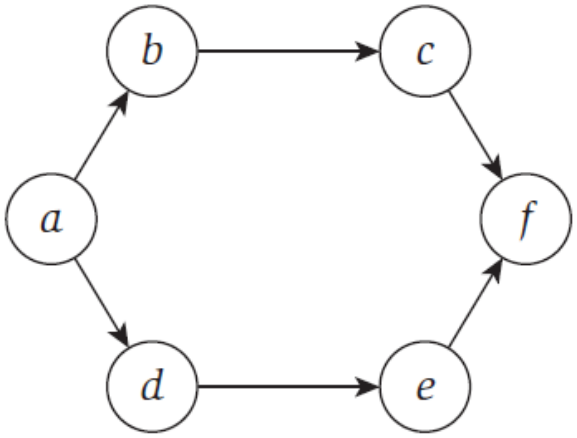
3 a) Is merge sort a stable sorting algorithm? Yes/No. Justify. Suggest a pseudo-code for merge sort and analyze its worst-case complexity. **10**

b) Write the Prim's algorithm. Apply Prim's algorithm to the following graph. Start from vertex 'a'. **10**



UNIT - III

4 a) Write an algorithm for breadth first search. Consider the directed acyclic graph G given below. List out all the topological orderings for the given graph. **10**



b) When does collision occur in hashing? Illustrate the two different mechanisms used to resolve collisions with an example. **10**

OR

5 a) With relevant illustrations, outline the three different algorithms for generating combinatorial objects. **10**

b) Write Horspool's algorithm for pattern matching. Construct a shift table for the pattern LEADER and search for the same in the text JIMY_HAILED_THE_LEADER_TO_STOP using Horspool's algorithm. **10**

UNIT - IV

6 a) Write the bottom-up heap construction algorithm. Sort the list {1, 2, 3, 4, 5} by heapsort using the array representation of heaps. **10**

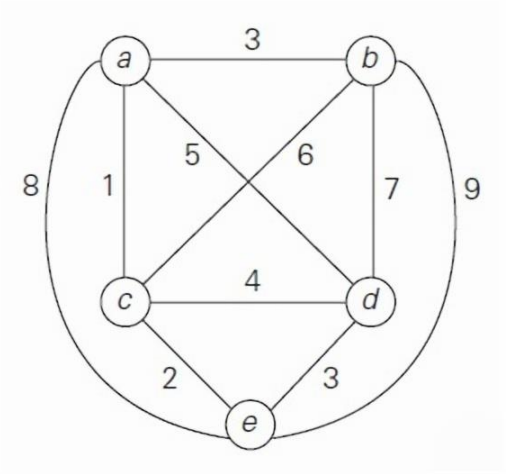
b) Write the algorithm for construction of 2-3 trees. Construct a 2-3 tree for the list {C,O, M, P,U, T, I,N,G}. Use the alphabetical order of the letters and insert them successively starting with the empty tree. **10**

UNIT - V

7 a) Apply backtracking to solve the following instance of the subset-sum problem S = {3, 4, 5, 6} and d = 9. Use the approach of state-space tree. **05**

b) Find one solution to 4-queens problem using state-space tree. **05**

c) Apply the branch-and-bound algorithm to solve the traveling salesman problem for the following graph: **10**



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