WEST BENGAL STATE UNIVERSITY

B.A./B.Sc. Honours 6th Semester Examination, 2022

CMAACOR13T-COMPUTER APPLICATION (CC13)

DESIGN AND ANALYSIS OF ALGORITHM

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

1. Answer any ***four*** questions from the following: 2×4 = 8

   (a) What are the different characteristics of an algorithm?

   (b) Define $f(n) = O(g(n))$ where $f(n)$ and $g(n)$ are two functions of n.

   (c) What do you mean by a Spanning Tree?

   (d) What are the different characteristics of divide and conquer method?

   (e) Why quick sort is called in-place sorting?

   (f) What do you mean by an internal sorting?

   (g) When do we use branch and bound method?

   (h) What do you mean by a Decision Tree?

Answer any *four* questions 8×4 = 32

2. (a) Solve the following Recurrence Relation: 5+3

$$T(n) = \begin{cases} 2T(n/2) + n & \text{if } n > 1 \\ 1 & \text{if } n = 1 \end{cases}$$

   (b) Prove that the worst case time complexity of bubble sort algorithm is $O(n^2)$.

3. (a) Define heap. What are the minimum and maximum number of elements in a heap of height *h*? 1+2+2+3

   (b) Is the sequence < 23; 17; 14; 6; 13; 10; 1; 5; 7; 12 > a heap?

   (c) Sort the above sequence of elements using HeapSort algorithm.

4. (a) Write the Quick Sort algorithm to sort a list of integers in ascending order considering the first element as the partitioning element. 5+3

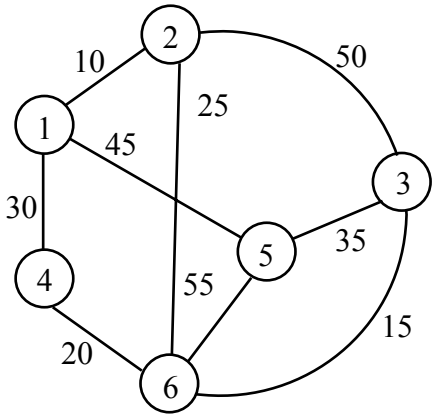
   (b) Find out the best case and worst case time complexity of the above algorithm.

5. (a) Compare Divide and Conquer and Dynamic Programming Methodologies. 4+4

   (b) Write an algorithm to merge two sorted arrays into a single sorted array.

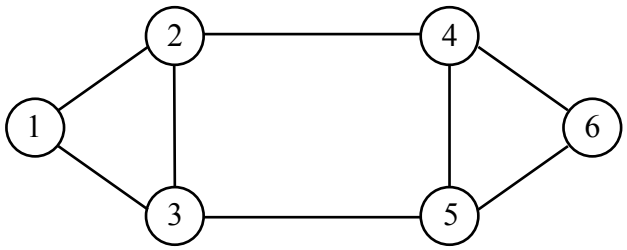
6. (a) Write Prim's algorithm to find the minimum spanning tree of a given graph. 3+5

   (b) Show the execution trace of the above algorithm for the following graph.



7. (a) Distinguish between DFS and BFS algorithm. 2+(3+3)

   (b) Trace the following graph using DFS and BFS



8. (a) State KMP pattern matching algorithm. 4+4

   (b) Verify the above algorithm for the following:

   T = bacbababababacbb & P = ababa.

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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