



**WEST BENGAL STATE UNIVERSITY**

B.Sc. Honours 4th Semester Examination, 2020

**CMSACOR08T-COMPUTER SCIENCE (CC8)**

**DESIGN AND ANALYSIS OF ALGORITHM**

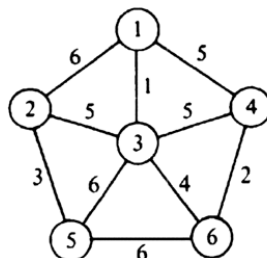
Time Allotted: 2 Hours

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.*

**Answer Question No. 1 and any four from the rest**

1. Answer any **four** questions from the following: 2×4 = 8
  - (a) How does dynamic programming approach differ from the divide and conquer approach?
  - (b) What are internal sorting and external sorting? Give example of each category.
  - (c) What is amortized algorithm?
  - (d) What type of searching is used in finding a word in dictionary? Why?
  - (e) Define Big-Oh (O) notation.
  - (f) Define recurrence tree, and give an example.
  - (g) Write down the average case time complexity of Quick sort and Merge sort.
  
2. (a) Deduce the recurrence relation of binary search and solve it. 2+3  
(b) Write a short note on Master's Theorem. 3
  
3. Define red-black tree. Create a red-black tree by inserting following sequence of numbers 8, 18, 5, 15, 17, 25, 40 and 80. Why a red node cannot have a red parent or red child in red-black tree? What is the largest possible number of internal nodes in a red-black tree with black-height  $k$ ? 2+2+2+2
  
4. (a) Why is the decision tree important? 2  
(b) Define minimum spanning tree with respect to a graph. 2  
(c) Find the minimum cost spanning tree of the following graph using Prim's algorithm. Explain each step. 4



5. (a) As part of maintenance work, you are entrusted with the work of rearranging the library books in a shelf in proper order, at the end of the day. Which of the following will be the ideal choice for this purpose? Justify your answer. 2  
 (i) Bubble sort, (ii) Selection sort, (iii) Insertion sort, (iv) Heap sort.
- (b) Write down the best, worst, and average case time complexity for each of the above-mentioned sorting techniques.  $1\frac{1}{2} \times 4 = 6$
6. (a) Explain KMP algorithm for Pattern Searching with a suitable example. 5  
 (b) Calculate  ${}^6C_2$  using dynamic programming. Also, indicate where dynamic programming is used. 2+1
7. (a) Find the optimal solution using Greedy criteria for a knapsack having capacity 100 Kg for the following list of items having values and weights as shown in the table. Explain each step. 3

Item	Value	Weight
$I_1$	10	15
$I_2$	20	25
$I_3$	30	35
$I_4$	40	45
$I_5$	50	55

- (b) Find the time complexity of the following recurrence relation:  $2\frac{1}{2}$   

$$T(n) = 2T(n-1) + 1$$
- (c) What is heap? How can a heap be represented by an array?  $1+1\frac{1}{2}$

**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.

—x—