



WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 4th Semester Examination, 2022

CMSACOR08T-COMPUTER SCIENCE (CC8)

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.*

GROUP-A

1. Answer any **four** questions from the following: 2×4 = 8
- (a) Describe the characteristics of algorithm with an example.
 - (b) Write two differences between divide and conquer and greedy method.
 - (c) What is feasible solution and optimal solution?
 - (d) What is called external sorting?
 - (e) Find the time complexity of the following recurrence relation:
$$T(n) = 2T(n - 1) + 1$$
 - (f) Suppose you have to search an item from a list of data items arranged in random fashion then which searching algorithm you prefer to use and why?
 - (g) What do you mean by stable sorting algorithm?

GROUP-B

Answer any four questions from the following

2. (a) Define big O , Ω , θ notations. 3
(b) What is searching? Deduce the time complexity of binary search technique. 1+4
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 maximum possible number of internal nodes in a red-black tree with black-height k ? 2+2+2+2
4. (a) $T(n) = c$, when $n = 1$ and $T(n) = 2T(n/2) + c$ when $n > 1$. Solve the recurrence relation. 4
(b) Apply quick sort algorithm to sort the list. E, X, A, M, P, L, E in alphabetical order. 4
5. (a) If $f(x) = a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \dots + a_1 x + a_0$, where $a_0, a_1, \dots, a_{n-1}, a_n$ are real numbers, then prove that $f(x)$ is $O(x^n)$. 3

- (b) Critically comment on “In general, the Greedy strategy does not work for the 0–1 Knapsack problem”. 2
- (c) Solve Knapsack problem for the following given parameters: $n = 3$; knapsack capacity $m = 20$; profits $(P_1, P_2, P_3) = (25, 24, 15)$; and weights $(w_1, w_2, w_3) = (18, 15, 10)$. 3

6. (a) Use Depth First Search (DFS) algorithm to find different depth first trees for the graph in Figure 1. 5

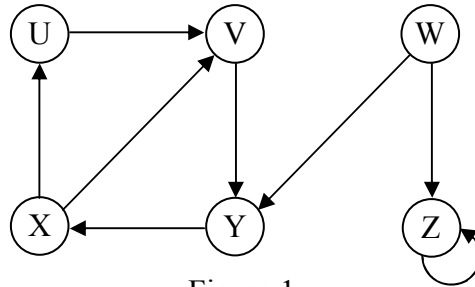


Figure 1:

- (b) Estimate the time complexity of DFS algorithm. 2
- (c) Which data structure is needed for Breadth First Traversal on a graph? 1

7. (a) Define minimum spanning tree with respect to a graph. 2
- (b) Use Prim’s algorithm to find a minimum spanning tree of the graph in Figure 2. 5

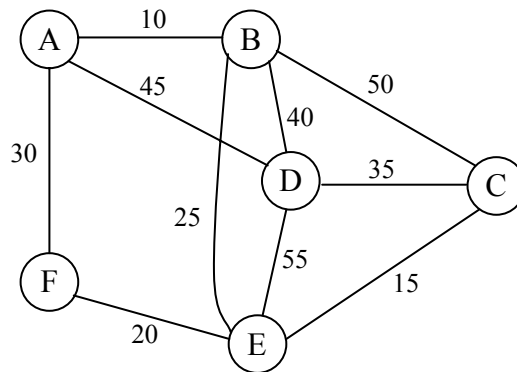


Figure 2:

- (c) What do you understand by an optimization problem? 1

8. Write short notes on the following (any *two*): 4+4

- (a) Bucket Sort
- (b) Recursion Tree
- (c) KMP algorithm.

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—