

Please check that this question paper contains \_\_\_\_\_ questions and \_\_\_\_\_ printed pages within first ten minutes.

[Total No. of Questions: 09]

[Total No. of Pages: .....]

Uni. Roll No. ....

Program: Btech

Semester: 6<sup>th</sup>

Name of Subject: Design and Analysis of Algorithms

Subject Code: CS-14503

Paper ID: 15458

**Time Allowed: 02 Hours**

**Max. Marks: 60**

**NOTE:**

- 1) Each question is of 10 marks.
- 2) Attempt any six questions out of nine
- 3) Any missing data may be assumed appropriately

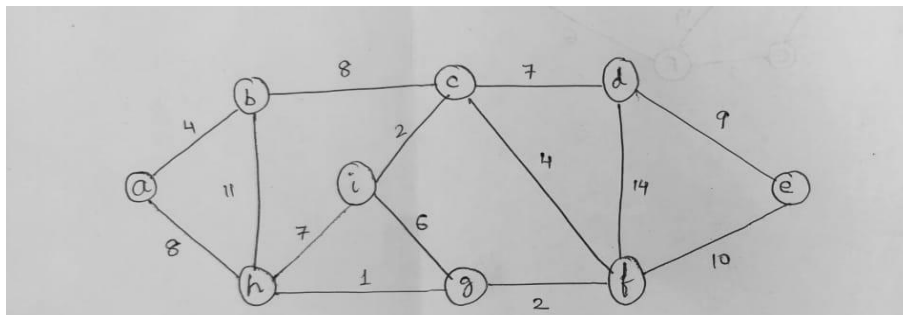
23-07-21(M)

**Q1.** Solve the following recurrence relation.

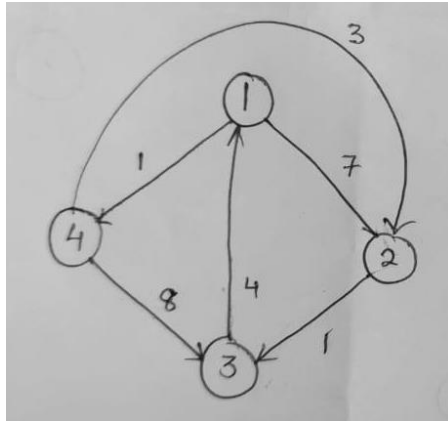
$$T(n) = 2T(n/2) + 1$$

**Q2.** What will be the running time of a quicksort algorithm when an array having distinct elements is sorted in decreasing order? Support your answer with suitable example.

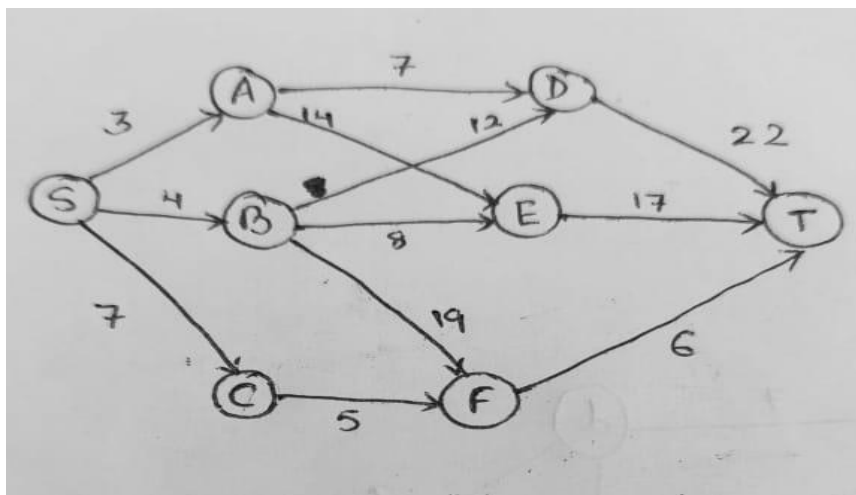
**Q3.** Build a Minimum Spanning Tree using both Prim's Minimum Spanning Tree Algorithm and Kruskal's Minimum Spanning Tree on the following graph step by step.



- Q4.** Find all pair shortest path for the following graph using Dynamic Programming technique. Also, show each calculation to support your answer.



- Q5.** Outline the applications of string matching in various scenarios.
- Q6.** Differentiate fractional knapsack and 0/1 knapsack with suitable example.
- Q7.** Write short notes on:
- NP-hard problem
  - NP-complete problem
- Q8.** Define backtracking. Also, elaborate how backtracking can be used to solve graph coloring problem.
- Q9.** Sewage supply from a source S to a destination D has to be done in stages in the graph below. The supply can be done from a stage  $S_i$  to a stage  $S_{i+1}$ . Using a multi-stage graph approach, find out the minimum cost to supply the water from source to target using the backward approach. The weights of the edges denote the cost of the operation.



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