

2022
M.Sc. (Information Technology)-1st Semester
MS-62: Computer Algorithm

Time allowed: 3 Hours

Max. Marks: 80

NOTE: Attempt five questions in all including Q. No.-I which is compulsory and selecting one question from each Unit.

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- I. (a) What is the worst case complexity of quick sort? Give the reason why it is different from quick sort's best case complexity.
- (b) What is the maximum nodes a binary tree can have at i th level?
- (c) Give the definition of theta notation.
- (d) Define minimum spanning tree.
- (e) Define satisfiability problem.
- (f) Discuss the complexity of graph coloring.
- (g) State the principle of optimality. (3+2+2+2+2+3+2)

UNIT – I

- II. (a) What is a queue? How is linear queue different from circular queue? Write the algorithm for enqueue and dequeue for circular queue. Show the changes in queue of length 5 for the following operations:
enq 5, enq 6, enq 7, enq 8, enq 9, enq 10, deq, deq, enq 11.
- (b) Solve the following recurrence relation:
$$T(n) = 3T\left(\frac{n}{2}\right) + n \quad \text{for } n \geq 2, \quad T(1) = 1 \quad (10+6)$$
- III. (a) What is a stack? How it is different from queue? Discuss how stack and queue is used in traversal of a graph? Write the graph traversal algorithms.
- (b) What is time and space complexity? Explain the best case, worst case and average case complexity of an algorithm. (10+6)

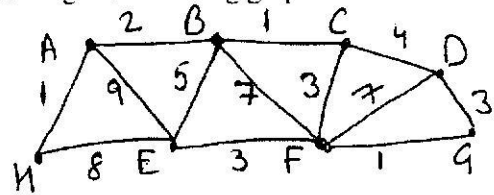
UNIT – II

- IV. (a) Compare and complexity of merge sort and quick sort for best case, worst case and average case.
- (b) Solve the following using Strassen matrix multiplication $\begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix} \times \begin{bmatrix} 1 & 5 \\ 3 & 8 \end{bmatrix}$.

(6+10)
P.T.O.

(2)

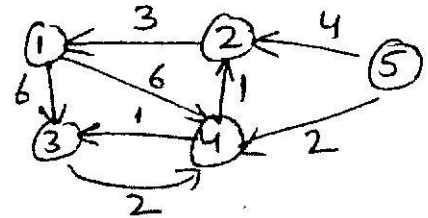
- V. Discuss the Prim's and Kruskal's method for solving the following graph. Write the algorithm for both and show the steps for how actually the minimum spanning tree is constructed using these methods. Give the relative advantages and disadvantages of both the methods.



(16)

UNIT – III

- VI. (a) What is the all pair shortest path problem? How it is different from single source shortest path? Solve the following all pair shortest path problem using Floyd algorithm.
- (b) Explain the control abstraction of backtracking using an example of graph coloring to explain the steps.



(8+8)

- VII. (a) What is an optimal binary search tree? Write the algorithm of optimal binary search tree.
- (b) What is n-queen problem? How it is solved using backtracking? Explain with the help of an example.

(8+8)

UNIT – IV

- VIII. (a) Define the following:
Deterministic algorithm, non-deterministic algorithm, Cook's theorem, NP-complete.
- (b) Explain the branch and bound technique using traveling sales person problem.
- IX. Explain the NP-Scheduling problems-
Scheduling identical processors and job-shop scheduling.

(16)