

(i) Printed Pages: 3

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(ii) Questions : 9

Sub. Code :

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Exam. Code :

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M.Sc. Information Technology 1st Semester

1128

COMPUTER ALGORITHMS

Paper : MS-62

Time Allowed : Three Hours]

[Maximum Marks : 80

Note :— Attempt five questions in all, including Q. 1 in Section-A, which is compulsory and taking one each from Section-B to Section-E. Marks are indicated on the right of various questions.

SECTION—A

1. (a) What is algorithm ? Explain with example.
- (b) Name any two non-linear data structures.
- (c) It takes 32 ms for an $O\left(\log_2^n\right)$ algorithm to execute a task for 8 data elements. How much time would it take when the data size is increased 8 times ?
- (d) What is the complexity of quick-sort algorithm if the input is completely sorted in ascending order or in descending order ?
- (e) Mention any two examples of greedy method that we are using in real-life.

- (f) What is the principle of optimality ?
- (g) State Cook's theorem.
- (h) What is Boolean satisfiability problem (SAT) ?

8×2=16

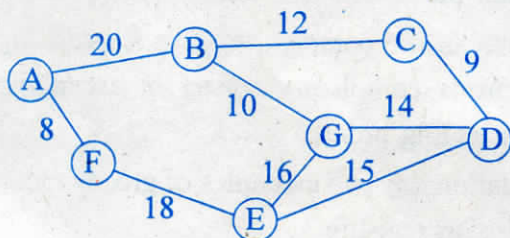
SECTION—B

2. (a) Give applications of queue data structure. Write an algorithm to perform insert and delete operation on single queue.
- (b) Define stack data structure. Explain PUSH and POP operation of the stack with algorithm. 8,8
3. (a) What do you mean by asymptotic notation ? Describe in brief any three asymptotic notations used for algorithm analysis.
- (b) Solve the following recurrence relation :

$$T(n) = 8T\left(\frac{n}{2}\right) + n^2. \text{ Here } T(1) = 1. \quad 8,8$$

SECTION—C

4. Define spanning tree and minimum spanning tree. Using Kruskal's algorithm, construct a minimum spanning tree from the following graph. Also evaluate its time complexity.



16

5. Explain Quick Sort algorithm and compute its average run time complexity. Using Quick Sort, arrange the following sequence in descending order :

25, 12, 9, 30, 15, 50.

16

SECTION—D

6. What is back tracking technique of problem solving ? Define 8-queen's problem and give the formulation for implicit and explicit constraints in case of 8-queen's problem. 16
7. What are the benefits of dynamic programming ? Give an algorithm based on dynamic programming technique to solve the traveling salesman problem. Explain with an example. 16

SECTION—E

8. State the 0-1 knapsack problem. Apply the branch-and-bound technique in solving the 0-1 knapsack problem. 16
9. Define P, NP, NP-Complete and NP-Hard problems with examples. Explain the relationship between class P; NP, NP-Complete and NP-Hard problems with suitable example of each class. Explain how you would prove that a decision problem D is NP-complete. 16