

**B.TECH. DEGREE EXAMINATION, MAY 2015****Sixth Semester**

Branch : Computer Science Engineering/Information Technology

CS 010 601/IT 010 605—DESIGN AND ANALYSIS OF ALGORITHMS (CS, IT)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

**Part A***Answer all questions.**Each question carries 3 marks.*

1. What are asymptotic notations ? With a figure explain any *two* of them used for specifying best and worst-case complexities.
2. Using recurrence, derive the complexity of merge-sort algorithm. What is the method behind the algorithm ?
3. What is multistage graph problem ?
4. What is state space tree ? Give an example.
5. Give algorithm for topological sort.

(5 × 3 = 15 marks)

**Part B***Answer all questions.**Each question carries 5 marks.*

6. State Master's Theorem for solving recurrences. Solve :

(i)  $T(n) = 3T\left(\frac{n}{4}\right) + n \lg n$  by this method.

7. Using divide and conquer, give an algorithm for binary search.
8. Give Prim's algorithm for obtaining a minimum spanning tree. What is the loop-invariant in the algorithm ?
9. Explain Monte-Carlo Method.
10. Explain complexity of  $k^{\text{th}}$  element selection.

(5 × 5 = 25 marks)

**Turn over**

## Part C

Answer all questions.  
Each full question carries 12 marks.

11. (a) Define Space and Time Complexity. Give an example. (4-marks)
- (b) Derive the asymptotic upper bound of  $T(n) = 2T\left(\frac{n}{2}\right) + n$  using substitution method. (4 marks)
- (c) Use a recursion tree to determine a good asymptotic upper bound on the recurrence

$$T(n) = 3T\left(\frac{n}{2}\right) + n.$$

(4 marks)

Or

12. Write an algorithm to sort an array of  $n$ -elements using insertion sort and derive its best and worst case runtime complexities. (12 marks)
13. Explain quick sort algorithm. Derive its running time. Show the various steps in quick sorting of  $\langle 13, 4, -9, 25, 1, 6, 15, 32 \rangle$ . (12 marks)

(12 marks)

Or

14. Give Strassen's matrix multiplication method. Compare it with the usual matrix multiplication algorithm. (12 marks)
15. (a) What is principle of optimality? (3 marks)
- (b) Compare  $0/1$  Knapsack and fractional Knapsack problem. (4 marks)
- (c) Explain job sequencing with deadlines. (5 marks)

Or

16. (a) What is greedy strategy? (3 marks)
- (b) Give a greedy solution for Knapsack problem. Can greedy method used for solving  $0/1$  Knapsack problem? (5 marks)
- (c) Compare dynamic programming and divide and conquer method. (4 marks)

17. State the puzzle problem. What is the best method for solving it ? Also give its complexity.

(12 marks)

*Or*

18. (a) Give FIFO and LIFO control abstractions in brand and bound method. (5 marks)

(b) What is backtracking ? Give any problem that can be solved by backtracking. (7 marks)

19. (a) Write short notes on deterministic and non-deterministic algorithms. (5 marks)

(b) How is comparison trees used in searching problems ? (4 marks)

(c) What is lower bound theory ? (3 marks)

*Or*

20. (a) Give Las-Vagas algorithm. (6 marks)

(b) Write the steps in Rabin-Karp algorithm. (6 marks)

[5 × 12 = 60 marks]