**E 257**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2003.

Third Semester

Computer Science and Engineering

CS 231 — INTRODUCTION TO ANALYSIS OF ALGORITHMS

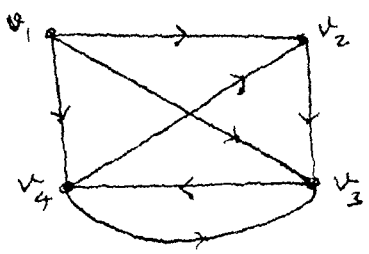
Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Build a heap from the following list of numbers : 45, 30, 50, 25, 60, 55, 75, 55.

2. Find the adjacency matrix of the graph given below.



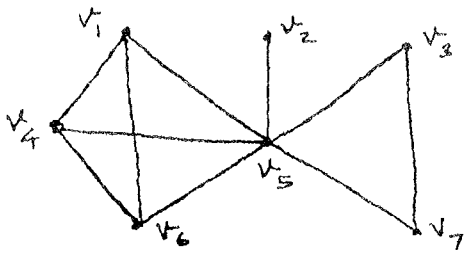

3. List the criteria for analyzing the complexity of algorithms.

4. Define lower bound of an algorithm. Find the lower bound of the algorithm of determining the minimum value of an array having $n$ distinct elements.

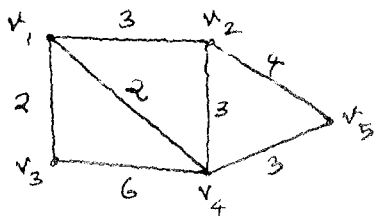
5. Explain the worst-case running time of the quicksort algorithm.

6. Explain the worst-case running time of the string-matching algorithm.

7. Define a cut-vertex of a graph. Identify the cut-vertices, if any, of the following graph.




8. Draw a minimal spanning tree to the following graph.




9. Define the graph coloring problem. Is it in NP?

10. State the Cook's theorem.

PART B — ($5 \times 16 = 80$ marks)

11. (i) Write down the HEAPSORT algorithm. Analyse this algorithm for its worst-case behaviour.

(ii) Draw the KMP flowchart for ABABCB.

12. (a) Explain the various representations of graphs.

Or

(b) Explain the standard ways of traversing a graph.

13. (a) Write down the linear search and binary search algorithms for searching for a particular record in an unordered table. Do the worst-case and average case analysis of the two algorithms.

Or

(b) Any algorithm to find the second largest in a list of $n$ keys must do at least $n + \lceil \log n \rceil - 2$ comparisons in the worst-case – Prove.

14. (a) Write down the shortest path algorithm and do a worst-case analysis of the algorithm.

Or

(b) Write down the biconnected components algorithm and also analyse the algorithm.

15. (a) Define the P, NP and NP-complete problems and derive the relationship between them.

Or

(b) Define an approximation algorithm for a problem. Give an approximation algorithm for the bin packing problem.

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