A 220

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2005.

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. Define a heap structure.

2. What is the complexity of algorithm for solving problems on graphs?

3. If $f(x) = x^3/2$ and $g(x) = 37x^2 + 120x + 17$, show that $g \in O(f)$, but $f \notin O(g)$.

4. What is the number of comparisons in finding the second largest in a set of or keys by the usual algorithm?

5. What are the number of comparison done by heap sort on the average and in the worst case?

6. Define finite automation.

7. Define a minimum spanning tree.

8. What is a biconnected component of an indirected graph?

9. When do you say that an algorithm is polynomially bonded?

10. If a graph has no edges, how many colors can be used for coloring the graph?

PART B — (5 × 16 = 80 marks)

11. (i) Write down an algorithm for depth–first traversal of a graph $G = (V, E)$. (8)

(ii) Construct a heap for the list 2, 9, 7, 6, 5, 8 by the bottom up algorithm. (8)

12. (a) (i) Write down the binary search algorithm to find the position of x in an ordered list of n elements. (8)

(ii) Design a variation of binary search that perform only one binary comparison (that is, the comparison returns a Boolean results) of k with an array entry, per function invocation. You may add additional comparisons on range variables. (8)

Or

(b) (i) Show that the following procedure places the man in $E[1]$. Array E is allocated for indexes $1, 2, \cdots, 2n - 1$.

```
heap Find Max (E, n)

int last;

Load n elements into E[n], ···, E [2*n – 1].

for (last = 2 * n – 2; last ≥ 2, last – = 2)

E[last/2]= max (E[last], E[last + 1]);
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(8)

(ii) Explain how to determine which elements lost to the winner. (4)

(iii) Complete the code to find second largest after heap Find Max Finishes. (4)

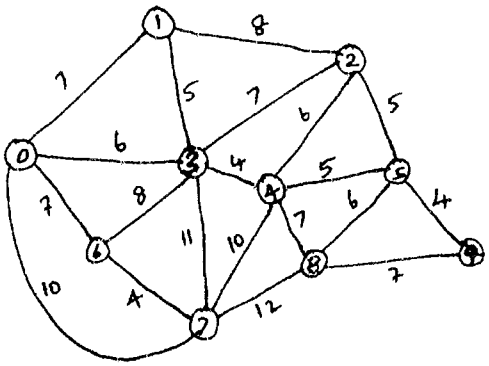
13. (a) Write down the quick sort algorithm and find the average case complexity.

Or

(b) (i) Draw the KMP flow chart for P = 'ABABCB'. (6)

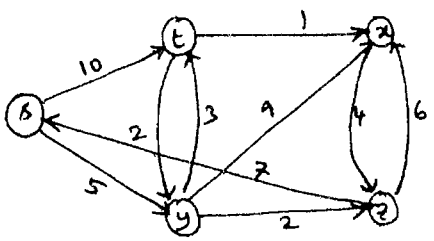
(ii) Explain the action of the KMP flow chart for the pattern 'ABABCB' on the text 'ACABAABABA'. (10)

14. (a) Construct a minimal spanning tree of the weighted graph.



Or

(b) Find the shortest path of the following directed graph with the source returns.



15. (a) Define the bin packing problem and write down the first fit decreasing algorithm. What is its complexity in the worst case?

Or

(b) What the greedy strategies that are used for the solution of traveling salesman problem? Give their algorithm with complexity.
