

2004 Algorithm Final Examination 6/10(四) 11:00~12:10

1. (30%)[0/1 Knapsack Problem] :

maximize $\sum_{1 \leq i \leq n} P_i * X_i$
 $1 \leq i \leq n$
subject $\sum_{1 \leq i \leq n} W_i * X_i \leq M$
and $X_i = 0$ or 1 , $P_i > 0$, $W_i > 0$, $1 \leq i \leq n$.

Please solve the above problem by a branch and bound algorithm.

You might explain it by answering the following questions.

- (1) What is your solution space tree structure?
- (2) What is your branching rule?
- (3) What is your lower bound evaluation for each sub-tree?
- (4) What is your upper bound evaluation for each sub-tree?
- (5) What is the condition that you can prune some impossible branch?
- (6) When will your algorithm be terminated?
- (7) Why is your answer correct?

2. (15%)Please describe the dynamic programming by an example.

3. (20%)Please describe a 2-approximation algorithm for the bottleneck traveling salesperson problem.

$R = P_i$

$T = Q1$

4. (20%)Enumerate an example to PTAS.

5. (15%)Show that "the selection problem" can be solved in linear time.

$P_1, P_2, P_3, P_4 \dots M = 20$