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**Algorithm 4.1** KNAPSACK FPTAS

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*Input.* Integer  $W$ , vectors  $w, c \in \mathbb{N}^n$ , a number  $\varepsilon > 0$ .

*Output.* Vector  $x \in \{0, 1\}^n$  such that  $\text{weight}(x) \leq W$ .

Step 1. Run **GREEDY** on the instance  $W, w, c$  and let  $x$  be the solution. If  $\text{val}(x) = 0$  then return  $x$ .

Step 2. Set  $t = \max\{1, \varepsilon \text{val}(x)/n\}$  and set

$$c'_j = \left\lfloor \frac{c_j}{t} \right\rfloor \quad \text{for } j = 1, \dots, n.$$

Step 3. Set  $C = 2\text{val}(x_1)/t$  and apply the **DYNAMIC PROGRAMMING KNAPSACK** algorithm on the instance  $W, C, w, c'$  and let  $y$  be the solution obtained.

Step 4. If  $\text{val}(x) \geq \text{val}(y)$  return  $x$  otherwise  $y$ .

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