Ministry of Education and Science of Ukraine

National Technical University of Ukraine

«Kyiv Polytechnic Institute. Igor Sikorsky »

Faculty of Informatics and Computer Technologies

Department of Computer Engineering

LAB № 8

from the discipline "Theory of Algorithms"

on the topic «Dynamic programming»

PERFORMED BY:

1st year student

group ІП-93

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The credit - 9312

Variant – 12

CHECKED:

Associate Professor of OT

c.t.s.,s.r.

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Kiev - 2020

**TASK**

**Goal:**

implementation of the dynamic programming algorithm for the backpack problem.

**Option task:**

Given are n different items known about their size, or weight, *wi*, and cost *vi*. There is a backpack in which to put these items. The backpack is known for its capacity (total size, or weight, of items that can be placed in the backpack) - W. It is necessary to select a set of items S among all given items that (1) their total dimension does not exceed the capacity of the backpack W and (2) the total value of the objects in the set S is the highest possible among all other sets.

**CODE**

# Algorithm itself

**def** knapSack**(**W**,** wt**,** val**,** n**):**

K **=** **[[**0 **for** x **in** **range(**W **+** 1**)]** **for** x **in** **range(**n **+** 1**)]**

# Build table K[][] in bottom up manner

**for** i **in** **range(**n **+** 1**):**

**for** w **in** **range(**W **+** 1**):**

**if** i **==** 0 **or** w **==** 0**:**

K**[**i**][**w**]** **=** 0

**elif** wt**[**i**-**1**]** **<=** w**:**

K**[**i**][**w**]** **=** **max(**val**[**i**-**1**]** **+** K**[**i**-**1**][**w**-**wt**[**i**-**1**]],** K**[**i**-**1**][**w**])**

**else:**

K**[**i**][**w**]** **=** K**[**i**-**1**][**w**]**

**return** K**[**n**][**W**]**

# Input values of items

val **=** **[**60**,** 100**,** 120**,** 230**]**

# Input weigth of items

wt **=** **[**10**,** 20**,** 30**,** 30**]**

# Input weight of pack

W **=** 50

n **=** **len(**val**)**

# Output data

**print(**knapSack**(**W**,** wt**,** val**,** n**))**

**RESULTS OF THE PROGRAM WORK**

The input array is:

# Input values of items

val = [60, 100, 120, 230]

# Input weigth of items

wt = [10, 20, 30, 30]

# Input weight of pack

W = 50

Output array:

330

**CONCLUSIONS**

I got acquainted with the topic of laboratory work.

Have acquired relevant work skills.

An appropriate test program has been developed.

Learn the history of creating this task. Considered several solutions, namely through dynamic programming.