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Input data for the MLCLSP

(see: Tempelmeier, Horst and Matthias Derstroff, A Lagrangean-based Heuristic for Dynamic Multi-level Multiitem Constrained Lotsizing with Setup Times, in: Management Science 42(1996)5, pp. 738-757)

The test data on the accompanying floppy disc are organized in directories PROBA, PROBB,...,PROBD according to the problem classes considered. Within a directory there may be several subdirectories. **Note that all problem instances have already been generated.**

The meaning of the file extensions are:

*.DAT	description of the BOM structure
*.DT?	end product demand data
*.TBO	TBO profiles
*.CAP	target utilization profiles
*.XLS	MS-Excel 5.0 results files or problem description files

Each problem instance is identified by a name composed of letters and digits as follows (Italic words are comments.):

```
G0141111.DAT
.  ......
.  .....# of generated demand time series (here: #1)
.  ....# of TBO profile (here: #1)
.  ...# of utilization profile (here: #1)
.  ..coefficient of variation of end item demand (here: CV= 0.1)
.  .# of end items (here: 4)
.  # of  setup time profile (here: #1)
identification of gozinto structure (here: G0; g=general; k=assembly; second digit used for identification of special type of structure)
```

This problem instance name is analyzed digit by digit and a specific problem instance is generated with the help of the following data sets. (We stored these data sets in separate files; in the following example data for a BOM structure called G0 (general with as special assignment pattern of items to resources) are shown).

The following names are used:

G00_____.___	Problem class A, general BOM structure, non-cyclic relations between resources and items (Table 8, A1)
G50_____.___	Problem class A, general BOM structure, cyclic relations between resources and items (Table 8, A2)
K00_____.___	Problem class A, assembly BOM structure, non-cyclic relations between resources and items (Table 8, A3)
K50_____.___	Problem class A, assembly BOM structure, cyclic relations between resources and items (Table 8, A4)
G01_____.___	Problem class B, general BOM structure, non-cyclic relations between resources and items (Table 8, A1), Setup time profile 1

G51_____.___	Problem class B, general BOM structure, cyclic relations between resources and items (Table 8, A2), Setup time profile 1
K01_____.___	Problem class B, assembly BOM structure, non-cyclic relations between resources and items (Table 8, A3), Setup time profile 1
K51_____.___	Problem class B, assembly BOM structure, cyclic relations between resources and items (Table 8, A4)), Setup time profile 1
G02_____.___	Problem class B, general BOM structure, non-cyclic relations between resources and items (Table 8, A1), Setup time profile 2
G52_____.___	...

As an example, considered problem class A

BOM structure: file G0_____.DAT

```
 10 ..  number of items in gozinto structure
for each item one line:
item number
  .     setup time
  .     .       echelon holding cost
  .     .       .     not used
  .     .       .     .  not used
  .     .       .     .  .  number of  resource that produces the item
  .     .       .     .  .  .  not used
  .     .       .     .  .  .  .  production time per unit
  1  10.00  1.00  0  0  1  1  1.00
  2  10.00  1.00  0  0  1  1  1.00
  3  15.00  1.00  0  0  1  1  1.00
  4  15.00  1.00  0  0  1  1  1.00
  5  10.00  1.00  1  2  2  1  1.00
  6  10.00  1.00  1  1  2  2  1.00
  7   5.00  1.00  1  1  2  2  1.00
  8   5.00  1.00  2  3  3  2  1.00
  9   5.00  1.00  2  3  3  2  1.00
 10   5.00  1.00  2  2  3  1  1.00
The following lines describe the arcs in the bom structure (for each arc one line):
   parent item
   .  component
   .  .     number of component used for one unit of parent
   .  .     .     minimum lead time (not used in our numerrical experiment)
   1  5  1.00  0
   2  5  1.00  0
   2  6  1.00  0
   3  6  1.00  0
   3  7  1.00  0
   4  7  1.00  0
   5  8  1.00  0
   5  9  1.00  0
   6  9  1.00  0
   6 10  1.00  0
   7 10  1.00  0
   end of arcs
   0
```

For each BOM structure considered one desciption of this type is needed.

Note: For problem classes B and D, for both setup time profiles the same BOM structure description file names are used, allthough these are located in different subdirectories (..\SETUP1 or ..\SETUP2)

TBO profile: file G_____1_.TBO

item number
. mean time-between-orders

```
 1   1.00
 2   1.00
 3   1.00
 4   1.00
 5   1.00
 6   1.00
 7   1.00
 8   1.00
 9   1.00
10   1.00
```

Based on the given mean time-between-orders, the setup costs are computed as follows:
Berechnung der Rüstkosten s_i :

$$s_i = \frac{e_i \cdot \Phi D_i \cdot TBO_i^2}{2}$$

with:

e_i : *echelon holding costs of item i (provided with the description of the gozinto structure)*
ΦD_i : *mean total demand per period of item i (including derived demands)i*
s_i : *setup costs for item i (to be computed)*
TBO_i : *time-between-orders for item i*

For each TBO-profile considered one file of this type is needed. The file names are

G_____1_.TBO (General structure, TBO profile #1)
G_____2_.TBO ...
G_____3_.TBO
G_____4_.TBO
G_____5_.TBO

K_____1_.TBO (Assembly structure, TBO profile #1)
K_____2_.TBO ...
K_____3_.TBO
K_____4_.TBO
K_____5_.TBO

Demand times series for end items: file G_141___.DT1

mean end item demand per time period

```
70 30 50 100
```

period number
. demand for item #1
. . demand for item #2
. . . demand for item #3
. . . . demand for item #4

```
1 66 29 44  99
2 68 25 56 101
3 64 32 46  86
4 82 34 54 114
```

For each demand time series one such file of this type is used. The file names are (for the general BOM structure with 4 end items of problem class A):

Problem Class A (general structure with 4 end items):

G__041__.DT1	(CV=0.1; series #1)
G__041__.DT2	(CV=0.1; series #2)
G__041__.DT3	(CV=0.1; series #3)
G__041__.DT4	(CV=0.1; series #4)
G__041__.DT5	(CV=0.1; series #5)
G__044__.DT1	(CV=0.4; series #1)
G__044__.DT2	(CV=0.4; series #2)
...	
G__047__.DT1	(CV=0.7; series #1)
...	

Utilization profiles: file G014_1__.CAP

number of resource
. *mean target utilization*
```
1 0.90
2 0.90
3 0.90
```

For each utilization profile one file of this type is needed. The file names with respect to the general BOM structure with 4 end items in problem class A are:

G004_1__.CAP	(util-profile #1)
G004_2__.CAP	(util-profile #2)
G004_3__.CAP	(util-profile #3)
G004_4__.CAP	(util-profile #4)
G004_5__.CAP	(util-profile #5)

For problem class D, the relevant *.CAP files are located in the lowest subdirectories. For example, for the assembly structure (K), TBO profiles 2, 3, 4 and 5, coefficient of variation of end product demand of 0.1 and 0.5 the *.CAP files are located in subdirectory A:\PROBD\KONV\TBO2_5\CV0105

Process of generating one problem instance:

```
G0143251.DAT
↑↑.....     Read file G0_____.DAT (from SD A:\PROBA or A:\PROBB,
                depending problem class A or B)
..↑....     here use G0_____.DAT from SD A:\PROBB (setup time profile 1)

.....↑.     Read file G0____5_.TBO (TBOs for all items) and compute
                setup costs (use the eclosed program GENDATA.EXE)

...↑....    identification of the number of end items used
```

....↑..↑ Read file `G_143___.DT1` (demand series #1 with CV=0.3 for problem with 4 end items)

.....↑.. Read file `G014_2__.CAP` and set resource capacities by dividing the mean total demand of the items to be produced on a resource by the target resource utilization (use GENDATA.EXE).
For problems with setup times compute the capacity required based on lot-for-lot production.

To generate a specific problem instance, copy all relevant files needed into a separate subdirectory and run program GENDATA.EXE. GENDATA.EXE reads an input file called MLCLSP.IN that contains the names of the problem instances to be generated, e.g.

```
G0141111.DAT     (line#1 of MLCLSP.IN)
G0141112.DAT     (line#1 of MLCLSP.IN)
END
```

In the example GENDATA.EXE generates the files G0141111.TMP and G0141112.TMP containing the setup costs and the capacities.