Otto-von-Guericke-Universität Magdeburg
Fakultät für Wirtschaftswissenschaft
Lehrstuhl für Betriebswirtschaftslehre VIII
- Management Science -
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End-Term Test

Production Management & Operations Research

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Last name: …….. First name: …….. Matriculation number: ……...

Assignment # 1 (10 points)

„In order sequencing, for a given set of orders, the minimization of the average order processing time and the minimization of the total waiting time of all orders are equivalent goals."

a) Give a definition of the average order processing time!

b) Give a general proof of the above statement!

Do not forget to define all the symbols properly you have to introduce!

Assignment #2 (20 points)

Five product types are to be manufactured in a three-stage production process. The operation times for the corresponding production orders (A, B, C, D, E) differ for these three stages, as can be seen from the table below.

production stage / production order	(1)	(2)	(3)
A	3	4	6
B	7	4	2
C	6	4	8
D	6	1	4
E	4	1	5

The sequence of stages, which the orders have to pass through, is identical for all orders. Overtaking of orders is not permitted.

a) Apply Johnson's Algorithm to this three-stage problem! How many solutions gives Johnson's Algorithm in this case?

b) For each solution, plot the corresponding GANTT-chart!

c) Determine the cycle times of the solutions! Which is the best solution? Is the best solution an optimal one?

Assignment # 3 (20 points)

The following table lists those work elements (operations), which have to be carried out on a production line on which car stereos of a specific type are produced. The list also includes information on the operation times of the work elements and the relevant precedence relationships.

work element i	operation time t_i	direct predecessor(s)
1	30	-
2	52	-
3	45	2
4	23	1, 3
5	15	1, 3
6	45	2
7	45	5, 6
8	45	4, 7

The desired average output rate is 40 stereos per hour.

a) What is the maximal cycle time, which cannot be exceeded if 40 stereos are to be produced per hour?

b) What is the theoretical minimum number of work stations for the desired output rate?

c) For the precedence relationships given in the above table, plot the corresponding precedence diagram?

d) Assign the work elements according to the method of Helgeson and Bernie!

e) How many work stations are necessary? Also determine the total idle time and the capacity utilization of this solution!

f) Is the solution an optimal one?