Otto-von-Guericke-University Magdeburg
Faculty of Economics and Management
- Management Science -
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ManSci

End-Term Test

Production Management & Operations Research (5074)

July 24, 2008

Last name: ....… **First name:** ....….…. **Matriculation No.:** ....

Examination: Production Management & Operations Research   SS 2008
Examiner: Prof. Dr. G. Wäscher

General remarks:

1. Write your name and matriculation number on this cover sheet and on every other sheet that has been issued to you.

2. Leave a minimum of 4 cm as correction space on the outside margin of each page.

3. Make sure that you have a complete copy of the test. The test consists of **3 assignments**, all of which have to be dealt with. It is not permitted to remove the retaining clip; doing so will be treated as fraudulent behaviour.

4. Please write legibly and number the pages which have been used. For each assignment, put down your answers on a separate sheet. Only pens with permanent ink may be used, while correction pens or ink erasers are not permitted. Make sure that you don't write in red.

5. Always make clear how you have determined your solution (solution path). Isolated solutions without traceable origin will not be accepted.

6. The following aids may be used: writing utensils, non-programmable pocket calculators without communicating and/or data processing functions, dictionaries (without any added remarks only).

Assignment 1   (14 points)

The following activity-on-node network represents a project.
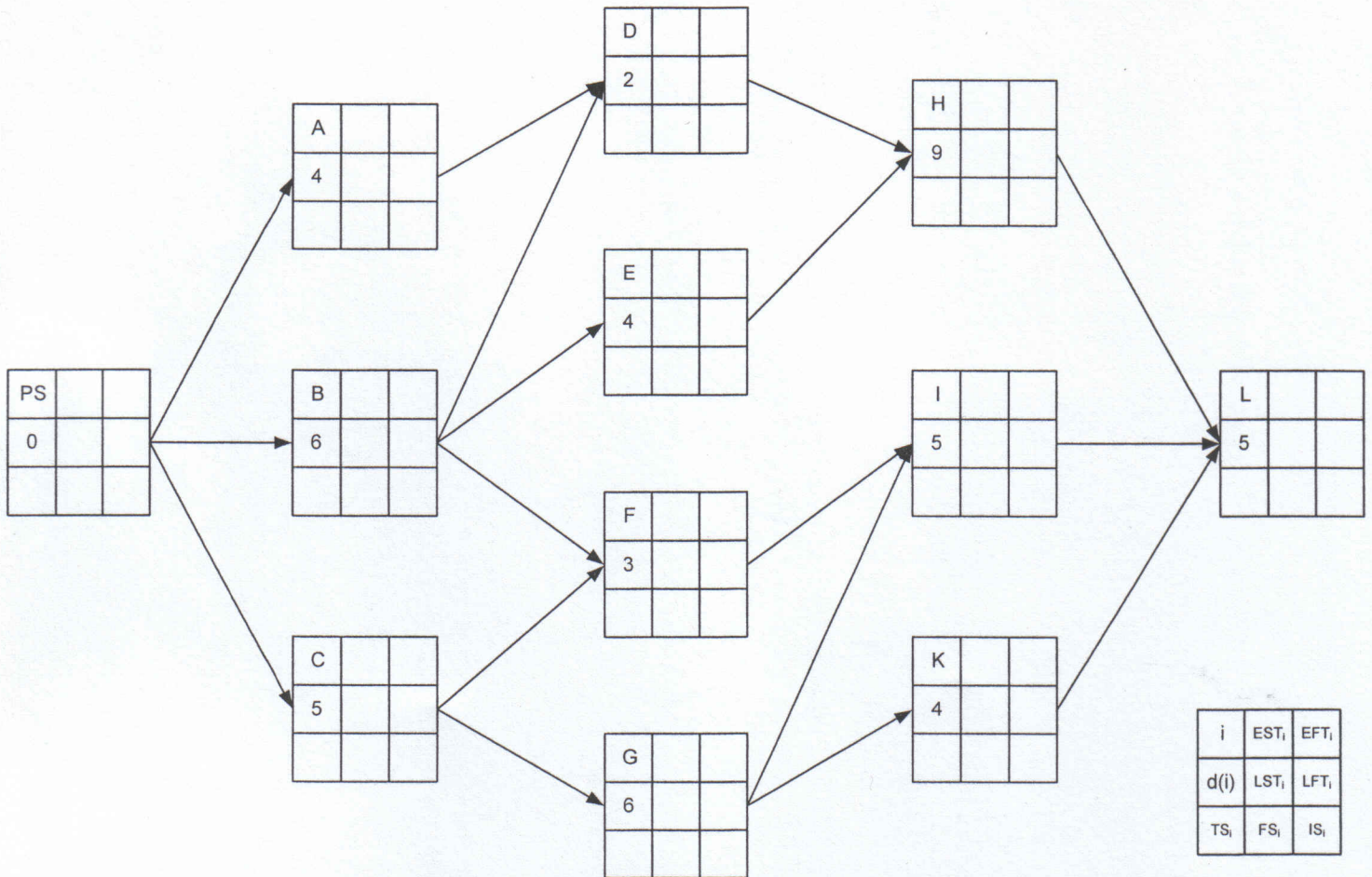
a)   For each activity, determine the earliest and latest start time, the earliest and latest finishing time, and the total, free and independent slack! Use the network given above to present your results!

b)   Identify the critical path(s)! Why is it important to know the critical path(s)?

c)   Transform the activity-on-node network given above into an activity-on-arc network! You **do not** need to perform the calculations again!

Assignment 2 (13 points)

Your company manufactures five product types in a four-stage production process. The operation times of the corresponding production orders (A, B, C, D and E) on the different stages are given in the table below (operation times are given in minutes). Orders may overtake each other!

production order \ production stage	(1)	(2)	(3)	(4)	availability at production stage 1 at time
A	30	60	15	45	8:00 a.m.
B	30	45	60	45	7:00 a.m.
C	45	30	15	60	9:00 a.m.
D	15	30	30	60	7:00 a.m.
E	45	75	45	60	7:00 a.m.

The regular production shift starts at 7:00 a.m. Due to maintenance, production stage 3 will be closed between 9:30 a.m. and 10:30 a.m.

a) Determine an order sequence by means of the Shortest Remaining Operation Time Rule. Give the corresponding finishing time of the last order!

b) What can be said about the optimality of the obtained solution?

c) Determine the waiting time of order A!

Assignment 3   (18 points)

The following matrix C provides the data for a standard lot-sequencing problem.

$$C = (c_{ij}) =$$

lot \ lot	1	2	3	4	5
1	-	4	12	5	16
2	16	-	12	9	5
3	9	19	-	12	3
4	9	8	21	-	4
5	4	7	4	4	-

The matrix elements c_{ij} represent the set-up times (costs) which are necessary to prepare a flow line for processing product type j if the last product which has been processed was product type i.

Determine a lot sequence which minimizes the total set-up times (costs) by means of the Branch-and-Bound Method!