



Mid-Term Test

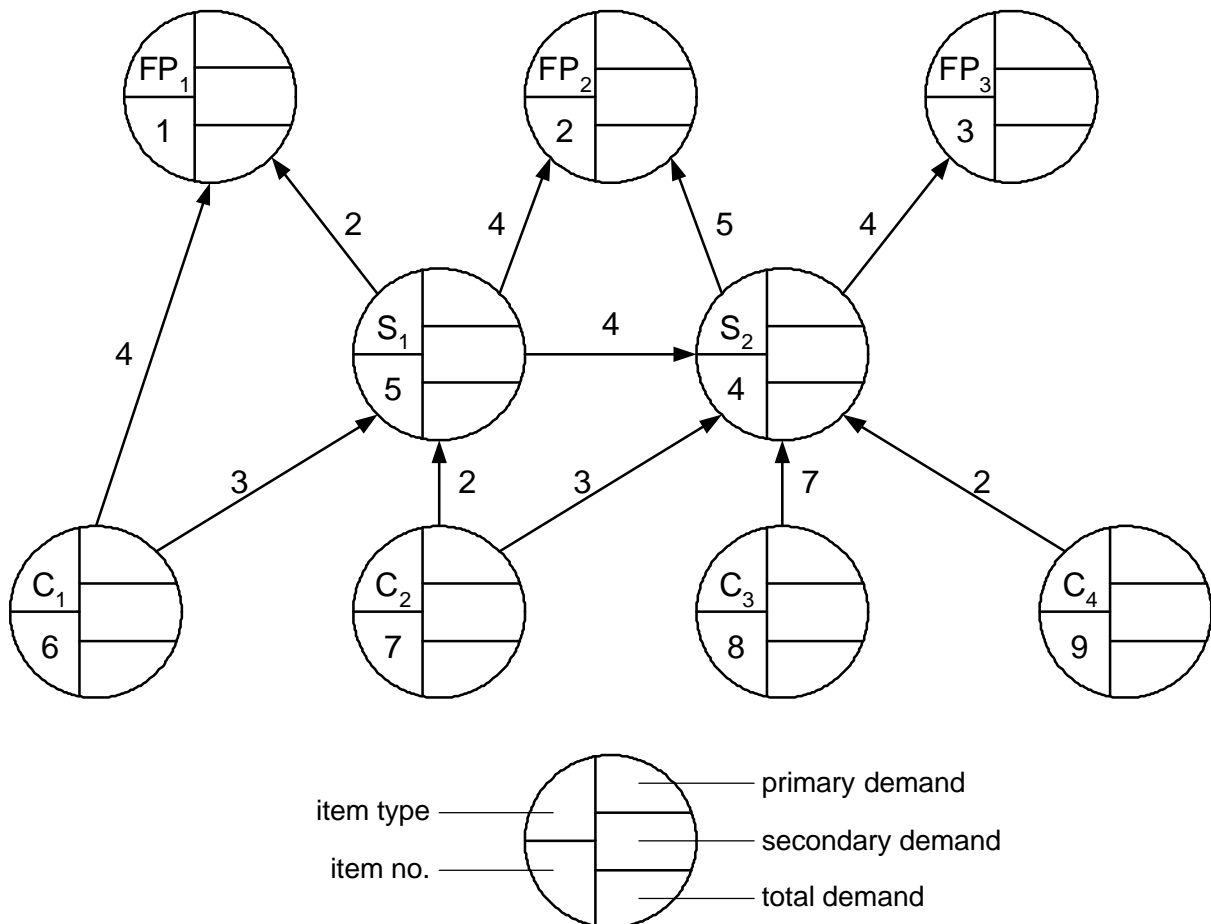
Production Management & Operations Research

December 10, 2002

Last name: First name: Matriculation number:

Assignment # 1 (16 points)

Let the following Gozinto-Graph be given:



- Determine the corresponding Technology Matrix! Give an interpretation of the entries in the S_1 -column!
- Of the corresponding Total Demand (Requirements) Matrix, compute the column for FP_2 ! Give an interpretation of the entries of this column!
- For the forthcoming week, by external customers 20 units each are required of products FP_1 and FP_3 , while the primary demand for FP_2 is zero. There is no primary demand for the sub-assemblies and the components; however, the production manager wishes to reduce the stock of S_2 by 10 units! Determine the total demand of all items for the forthcoming week!

Assignment # 2 (10 points)

In the Classic Economic Order Quantity (EOQ) Model the following statement is true for the optimal order quantity x^* :

“The total holding costs per time unit are identical with the total order costs per time unit”

- a) Present the EOQ-formula which can be derived from the classic model! Don't forget to define the symbols you are using!
- b) Give a general proof of the above statement!

Assignment # 3 (24 points)

“Italian Noodles” produces two types of gourmet pasta, Spaghetti (S) and Ravioli (R). Both products are sold in packages of one kilogram each. The price of a package of spaghetti is 2.20 €, while a package of ravioli is sold at 8.50 €. The variable costs have been calculated at 1.20 € (S) and 4.50 € (R), respectively.

The company will definitely not be able to satisfy the demand for spaghetti, however, it is expected that at most 5,000 kilograms per week can be sold of ravioli (sales/market constraint: M).

The basic pasta dough is identical for both products. The machine on which it is produced (D) provides 2 kilograms of pasta dough per minute. It will be operating for 20 hours per day.

In order to produce the spaghetti, the dough is simply pressed through a sieve, cut into the required length and dried afterwards, while the dough for the ravioli has to be cut into small rectangles at first, which are then filled with a meat filling, i.e. a mixture of minced meat and spices. *Pasta dough and meat filling each make up for 50 per cent of the weight of the final ravioli product.* There will be no shortages of the ingredients, neither for pasta dough nor meat filling.

The production manager wants to know what quantities (kilograms) should be produced of the two products S and R during the forthcoming week (5 working days) such that the profit of that period is maximized.

- a) Formulate a model from which the optimal production program can be determined! Do not forget to define the symbols used in the model!
- b) Calculate the optimal production program and the corresponding gross profit! On which decision rule is your suggestion for the production program based?
- c) Determine the shadow prices of D and M!
- d) Determine the opportunity cost of M! How far has the sales constraint M to be extended such that it is no longer binding?

Note: In order to answer questions b – d, neither application of the simplex method nor a graphical solution is required!