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Αίθουσα Τηλεδιάσκεψης Τμήματος Χωροταξίας (2ος όροφος),
Πεδίον Άρεως, Βόλος

Προσκαλούμε τους μεταπτυχιακούς και προπτυχιακούς φοιτητές μας, τα μέλη Δ.Ε.Π., τους διδάσκοντες του Τμήματος και κάθε ενδιαφερόμενο, στη δημόσια υποστήριξη της Διδακτορικής Διατριβής του κ. Παπαχρήστου Ιωάννη με τίτλο:

OPTIMIZATION OF FLEXIBLE PRODUCTION AND SUPPLY SYSTEMS

The present thesis deals with stochastic optimization problems that are related to the design and operation of flexible production and supply systems. In particular, the following two classes of problems are considered: i) server allocation in tandem queueing systems, and ii) the use of backup suppliers to hedge against supply risks.

For the first category of problems we consider two-stage queueing systems with one dedicated server in each station and a flexible server that can serve both stations. Assuming exponential service times and linear holding costs accrued by jobs present in the system, we seek optimal server allocation strategies within the classes of preemptive and non-preemptive policies for systems without external arrivals (clearing systems) and systems with Poisson arrivals under the discounted and the average cost criteria. For the model with a preemptive service discipline we assume that two servers can collaborate to work on the same job. When the combined rate of collaborating servers is less than the sum of their individual rates (partial collaboration), we identify conditions under which the optimal server allocation strategy is non-idling and has a threshold-type structure. Our results extend previous work on systems with additive service rates, either clearing or systems with arrivals and no dedicated server upstream. When the aforementioned conditions are not satisfied we show by examples that the optimal policy may have counterintuitive properties, which is not the case when a fully collaborative service discipline is assumed. We also obtain novel results for any type of collaboration when idling policies may be optimal and for systems with arrivals and dedicated servers in both stages. For the model with a non-preemptive service discipline we assume that the servers cannot collaborate and the dedicated servers are faster than the flexible server. We show that the dedicated server of the downstream station should never idle, and the same

is true for the dedicated server of the upstream station when holding costs are larger there. On the other hand, the optimal allocation of the slow server is investigated through extensive numerical experiments that lead to conjectures on the structure of the optimal policy.

For the second category of problems we consider newsvendor models in which a retailer facing random demand with known distribution places an order to a primary supplier who may not deliver the whole quantity ordered. We study two models of supply risk: suppliers who deliver a random portion of the order (random yield) and suppliers subject to random capacity, in which case the delivered quantity is limited by the realized capacity. To mitigate against such supply risks, the retailer contracts with a reliable backup supplier to buy the option to use his capacity after the delivery from the primary supplier. Depending on the responsiveness of the backup supplier, this option may be exercised before or after the demand becomes known as well. For the random yield case we also study models with two primary suppliers or two products sharing the same backup supplier. For all the aforementioned models we derive expressions for the optimal order and reservation quantities and obtain properties of these quantities. For the random capacity models we also determine the impact of the cost and revenue parameters on the optimal solution. Finally, we supplement our theoretical results with conjectures based on numerical experiments.