ABSTRAK

Tugas akhir ini mengembangkan model pengendalian persediaan barang deteriorasi dengan permintaan menurun linear dan *partial backorder* sebagai perluasan model Ouyang dkk. (2005). Fungsi permintaan menurun linear diperoleh melalui hampiran deret Taylor orde pertama. Tingkat persediaan pada setiap fase siklus dimodelkan menggunakan persamaan diferensial linear orde satu dengan syarat batas yang sesuai. Total biaya persediaan terdiri atas biaya penyimpanan, biaya pemesanan, biaya kerusakan barang, biaya kekurangan persediaan, dan biaya kehilangan penjualan. Optimasi dilakukan terhadap waktu habisnya persediaan dan panjang siklus melalui kondisi turunan parsial pertama yang bernilai nol. Keunikan dan keberadaan solusi optimal dibuktikan secara analitik menggunakan pendekatan deret Taylor, sedangkan konveksitas fungsi total biaya diverifikasi melalui analisis matriks Hessian. Solusi numerik diperoleh menggunakan metode Newton-Raphson. Validasi terhadap data aktual menghasilkan selisih biaya sebesar 2,36%, yang menunjukkan bahwa model mampu merepresentasikan kondisi operasional toko dengan baik.

Kata kunci: *model EOQ, barang deteriorasi, permintaan menurun linear, partial backorder, metode Newton-Raphson, matriks Hessian*

ABSTRACT

This undergraduate thesis develops an inventory control model for deteriorating items with linearly decreasing demand and partial backordering as an extension of the model proposed by Ouyang et al. (2005). The linearly decreasing demand function is derived from the first-order Taylor series approximation of an exponentially decreasing demand function. The inventory level in each phase of the cycle is modeled using first-order linear differential equations subject to appropriate boundary conditions. The total inventory cost consists of holding cost, ordering cost, deterioration cost, shortage cost, and lost sales cost. Optimization is performed with respect to the time when inventory is depleted and the cycle length by solving the first-order partial derivative conditions. The existence and uniqueness of the optimal solution are established analytically using the Taylor series approach, while the convexity of the total cost function is verified through Hessian matrix analysis. Numerical solutions are obtained using the Newton–Raphson method. Validation using actual data yields a cost difference of 2.36%, indicating that the proposed model is capable of representing the store's operational conditions satisfactorily.

Keywords: *EOQ model, deteriorating items, linearly decreasing demand, partial backordering, Newton–Raphson method, Hessian matrix*