

A new cell formation with part family clustering in cellular manufacturing system

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Abstract

Cellular manufacturing (CM) is an industrial application of group technology concept. One of the problems encountered in the implementation of CM is the cell formation problem (CFP). Minimizing of the number of Exceptional Elements (EEs) and voids are common goals in cellular manufacturing systems. The aim of this paper is a new model for CM that simultaneously in higher level, a CFP is designed which group machines and parts in dedicated cell with machine-part matrix; so that the number of voids is minimized in these cells. After identifying EEs, in lower level, the machines needed for remaining operations of parts that are not processed in dedicated cells, are determined to duplicate. So it produces new Machine- Part family matrix. Unlike previous models which focused just on similarity level in dedicated cell, by clustering this new matrix, two and more part families will be located in Shared cells. The proposed model, with nonlinear terms and integer variables, cannot be solved for real sized problems due to its NP-hardness. To solve the model for such applications, metaheuristic algorithms are proposed.

Keywords:

Cell formation, Part family clustering, Cellular manufacturing system, dedicated cell, Shared cell.