

ABSTRACT

Scheduling of machining and related operations in a manufacturing system is a key shop floor planning activity. Scheduling involves determination of the processing order of a set of jobs, each job requiring one or more operations to be performed in a planned sequence on specified machines with certain value of process times, over a span of time with an objective of minimising one or more selected measures of shop performance. In a dynamic job shop, where jobs arrive continuously, the research studies focus on the use of dispatching rules for scheduling of jobs. The problem of scheduling in dynamic job shop that process simple string type of jobs has been widely researched even though jobs requiring serial-parallel operations are often encountered in real life. The jobs that require serial-parallel operations are known as multi-level assembly jobs. Dispatching rules are required to address to the structural dependency or precedence constraints of these jobs. In the present study, the new dispatching rules are proposed and their performance is evaluated against various measures of performance. This study also aims at identifying the dispatching rules, which perform well against maximum values of certain performance measures. The maximum values of measures of performance are used to study the worst-case performance of various dispatching rules.

The present research study also focuses on developing dispatching rules incorporating customer priority through weights or penalties for lead-time and tardiness of jobs. The study is made in three phases. In the first phase, the performance of dispatching rules are studied considering unit cost rates for holding and tardiness of jobs. In the second phase, the jobs are assigned with equal holding and tardiness cost rates. In the last phase, unequal holding and tardiness cost rates are considered. A simulation study of a hypothetical dynamic job shop, processing three different assembly job structures has been made to evaluate the performance of the proposed and well-known

existing priority dispatching rules. The simulation experiments are conducted against two due date allowance factors and two shop utilisation levels using ARENA (Ver. 5.0) simulator. The results obtained through the simulation experiments have been subjected to one-way ANOVA and Tukey multiple comparison tests to ascertain if there are any statistically significant differences among the performances of various priority dispatching rules.