Tribhuvan University
Institute of Science and Technology

On the Cyclic Sequences in Mixed Model Just-in-Time Production System

Dissertation
Submitted to

Central Department of Computer Science and Information Technology
Kirtipur, Kathmandu, Nepal

In partial fulfillment of the requirements
for the Master's Degree in Computer Science and Information Technology

by

Prem Raj Bhatta

January 2009

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Supervisor

Dr. Tanka Nath Dhamala

Tribhuvan University
Institute of Science and Technology
Central Department of Computer Science and Information Technology

Student's Declaration

I hereby declare that I am the only author of this work and that no sources other than that listed here have been used in this work.

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Prem Raj Bhatta

Date: … … … …

Date: … … …. … … …

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Central Department of Computer Science and Information Technology

Supervisor's Recommendation

I hereby recommend that this Dissertation prepared under my supervision by **Mr. *Prem Raj Bhatta*** entitled **On the Cyclic Sequences in Mixed Model Just-in-Time Production System** in partial fulfillment of the requirements for the degree of M. Sc. in Computer Science and Information Technology be processed for the evaluation.

… … … … … … … … … …

Dr. Tanka Nath Dhamala
Asst. Prof. **Head**, Central Department of Computer Science and Information Technology
Institute of Science and Technology
Tribhuvan University, Nepal

Date: … … …. … … …

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Central Department of Computer Science and Information Technology

LETTER OF APPROVAL

We certify that we have read this dissertation and in our opinion it is satisfactory in the scope and quality as a dissertation in the partial fulfillment for the requirement of Masters Degree in Computer Science and Information Technology.

Evaluation Committee

… … …. … … … …

Dr. Tanka Nath Dhamala
Head,
Center Department of Computer Science
and Information Technology,
Tribhuvan University, Nepal

… … …. … … … …

Dr. Tanka Nath Dhamala
Head,
Center Department of Computer Science
and Information Technology,
Tribhuvan University, Nepal

(**Supervisor**)

… … …. … … … …
(External Examiner)

… … …. … … … …
(**Internal External**)

Date: … … …. … … …

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Date: ……

February, 2009 Prem Raj Bhatta

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ABSTRACT

On the Cyclic Sequences in Mixed Model Just-in-Time Production System

Mixed-model Just-in-Time production systems have been developed in recent years in order to reduce costs of diversified small-lot production, which involves producing only the necessary products in the necessary quantities at necessary times. This problem minimizes both the earliness and the tardiness penalties that respond to the customer demands for a variety of models without holding large inventories or incurring shortages. The problem of sequencing flexible transfer lines or mixed-model assembly lines according to the JIT philosophy can be formulated as a non-linear integer programming problem.

Minimization of the variation in demand rate for outputs of supplying processes is the output rate variation problem (ORVP) and minimization of the variation in the rate at which different products are produced on the line is the product rate variation problem (PRVP). The problem for minimizing of deviations between actual and desired production for PRVP can be solved efficiently in pseudo-polynomial time complexity. However, the ORVP with two or more levels is strongly NP-hard. But under the pegging assumption the ORVP can be solved efficiently.

In this dissertation, we implement different algorithms and heuristics to solve both ORVP and PRVP. The cyclic sequences are optimal for both sum-deviation and max-deviation PRVPs. The cyclic sequences to ORVP are presented with an example. Likewise, the existences of cyclic sequences to PRVP under different solution approaches are explored. Furthermore, several directions for further research are also explored including some emerged conjectures.

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DEDICATION

To My Mother Yashoda Bhatta

And

My Father Padam Raj Bhatta

Who spend their whole life

For

My Study

Date: … … …. … … …

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LIST OF ABBREVIATIONS

AP	Assignment Problem
DP	Dynamic Programming
EDD	Earliest-Due-Date
FCFS	First Come First Serve
JIT	Just-in-Time
JITSP	Just-in-Time Sequencing Problem
MDJIT	Maximum Deviation Just-in-Time
MMJIT	Mixed-Model Just-in-Time
MMJITSP	Mixed-Model Just-in-Time Sequencing Problem
ORVP	Output Rate Variation Problem
OS	Operating System
PRVP	Product Rate Variation Problem
PRV-MD	Product Rate Variation Maximum Deviation
PRV-MM	Product Rate Variation Mixed-Model
SASJ	Scheduling Around the Shortest Job
SDJIT	Sum Deviation Just-in-Time
SJF	Shortest Job First
SRTN	Shortest Remaining Time Next

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