

**A BINARY INTEGER LINEAR PROGRAMING
MODEL FOR THE TEACHER ALLOCATION
PROBLEM REFERRING TO PSHYCOLOGICAL
FACTORS FOR THE SRI LANKAN SCHOOLS**

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DECLARATION

I declare that this is my own work and this thesis/dissertation does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

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The above candidate has carried out research for the ~~PhD/MPhil~~/Masters thesis/dissertation under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor: Dr. RP Abeysooriya

Signature of the Supervisor:

Date: 18.07.2023

ABSTRACT

Many schools face challenges in optimizing their school timetables. Every school has its own set of criteria and limitations that are based on numerous elements such as number of teachers available, teacher competencies, number of subjects teach, time periods restrictions for academic lessons, and regulations established by the education authorities, etc. This study has two goals. First, consideration of practical constraints to the Sri Lankan school timetabling problems. Second, investigate the applicability of solving that problem to the optimality considering those practical constraints.

By far, the exact optimisation methods have been rarely applied to school timetabling problems in the past studies. This dissertation reviews those approaches in literature and investigates how well an Integer Programming (IP) optimisation approach performs for a set of selected timetable problems. After reviewing literature and a field study conducted in Southern province schools in Sri Lanka, the study presents four versions of IP optimisation models. 1) IP model focused on maximizing overall competency level of teachers with 10 basic constraints, 2) IP model focused on minimizing unfilled demand of teaching requirements with 10 basic constraints, 3) Extended version of model 1 with another 5 different practical constraints, 4) Extended version of model 2 with another 5 different practical constraints. The models were solved using the computational power of IBM ILOG CPLEX optimisation studio. In order to compare the performance of solving, four different timetable problems were used as data instances. The proposed methodology and tools were found to produce optimal timetable solutions within reasonable times for the loaded instances. While reaching the objectives of the study, the study successfully evaluated the applicability of different constraints arise in timetable preparations, using the proposed IP model and solving procedure.

Keywords: School timetabling Problems, Practical Constraints, Integer Programming, CPLEX

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