THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

This exam paper must not be removed from the venue

Venue _____

Seat Number _____

Student Number |__|__|__|__|__|__|__|__|

Family Name _____

First Name _____

School of Mathematics & Physics

EXAMINATION

Semester Two Practical Examinations, 2016

MATH4202/7202 Advanced Topics in Operations Research

This paper is for St Lucia Campus students.

Examination Duration: 90 minutes

Reading Time: 10 minutes

Exam Conditions:

This is a School Examination

This is an Open Book Examination

During reading time - writing is not permitted at all

This examination paper will NOT be released to the Library

Materials Permitted In The Exam Venue:

No restrictions

Materials To Be Supplied To Students:

Access to laboratory computers

Instructions To Students:

This exam contains five questions, with marks indicated, and you may attempt whichever questions you like. Note that the total marks available is more than 20 marks but your score for the exam will be capped at 20 marks.

You must submit your Python code through Blackboard.

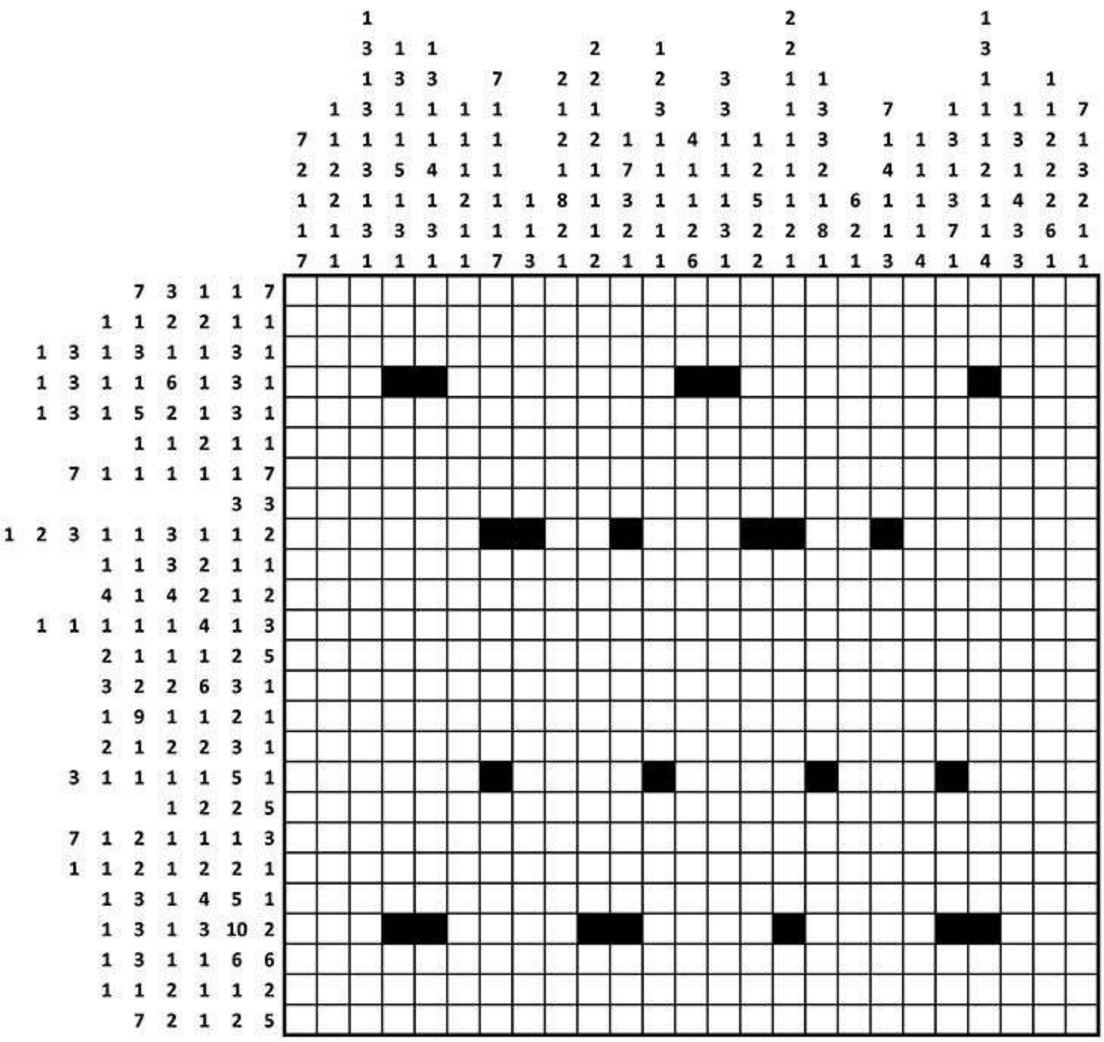
For Examiner Use Only

Question	Mark
1	
2	
3	
4	
5	

Total _____

Question 1

We consider the grid puzzle below.



In this type of grid-shading puzzle, each square is either black or white. Some of the black squares have already been filled in for you.

Each row or column is labelled with a string of numbers. The numbers indicate the length of all consecutive runs of black squares, and are displayed in the order that the runs appear in that line. For example, a label "2 1 6" indicates sets of two, one and six black squares, each of which will have at least one white square separating them. There may be any number of white squares at the beginning and end of each row or column, including none.

The file gridstub.py contains a representation of this data.

There are at least two completely different ways of representing this problem as an MIP – one with variables corresponding to blocks of black squares and one with variables corresponding to whole rows and columns.

1. Write down an MIP formulation of the problem in the blank space below. (5 marks)
2. Implement your MIP formulation in Python. (8 marks)
3. The current set of starting black squares has a unique solution. In the blank space below, describe a process to selectively remove pre-specified black squares to determine a set of black squares which still gives a unique solution, but which when made any smaller no longer gives a unique solution. (4 marks)
4. Implement your process from (3). (3 marks)
5. Write down an alternative MIP formulation of the problem, different from your answer to (1), in the blank space below. (3 marks)

END OF EXAMINATION

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