This Final Examination paper consists of 8 questions on 20 pages (including this one), printed on both sides of the paper. When you receive the signal to start, please make sure that your copy is complete and fill in the identification section above.

Answer each question directly on the exam paper, in the space provided, and use one of the “blank” pages for rough work. If you need more space for one of your solutions, use a “blank” page and indicate clearly the part of your work that should be marked.

In your answers, you may use without proof any result covered in lectures, tutorials, homework, tests, or the textbook, as long as you give a clear statement of the result(s) you are using. You must justify all other facts required for your solutions.

Write up your solutions carefully! In particular, use notation and terminology correctly and explain what you are trying to do—part marks will be given for showing that you know the general structure of an answer, even if your solution is incomplete.

If you are unable to answer a question (or part of a question), remember that you will get 10% of the marks for any solution that you leave entirely blank (or where you cross off everything you wrote to make it clear that it should not be marked).

**MARKING GUIDE**

# 1: _____/10
# 2: _____/12
# 3: _____/ 8
# 4: _____/10
# 5: _____/10
# 6: _____/10
# 7: _____/12
# 8: _____/ 8

**BONUS**
**MARKS:** _____/ 6

**TOTAL:** _____/80