UNIVERSITY OF LONDON IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND MEDICINE

EXAMINATIONS 1998

MEng Honours Degrees in Computing Part IV

MEng Honours Degree in Information Systems Engineering Part IV

MSci Honours Degree in Mathematics and Computer Science Part IV

MSc Degree in Advanced Computing

for Internal Students of the Imperial College of Science, Technology and Medicine

This paper is also taken for the relevant examinations for the Diploma of Membership of Imperial College Associateship of the City and Guilds of London Institute Associateship of the Royal College of Science

PAPER 4.85 / I4.24

NATURAL LANGUAGE PROCESSING Tuesday, April 28th 1998, 2.00 - 4.00

Answer THREE questions

For admin. only: paper contains 4 questions

- Most natural language sentences can have several different syntactic parses. How does a chart parser overcome the problem of representing these different parses? What are the other advantages of this approach?
- b Explain the difference between a well-formed substring table and an active chart. Show how the fundamental rule operates.
- c Show the active chart for the following sentence:

Jules saw that justice was important

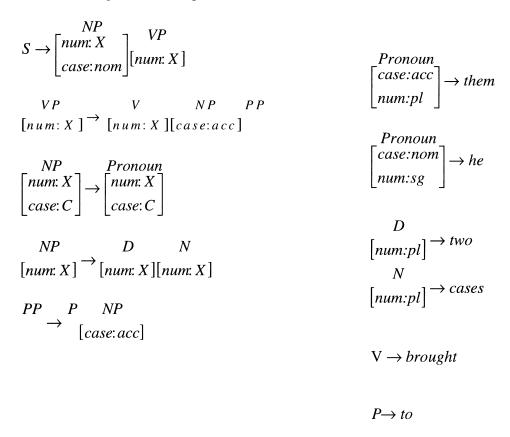
using the following grammar:

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s \rightarrow np, vp. rel \rightarrow [that]. vp \rightarrow v, np \mid v, adj \mid v, rel s. d \rightarrow [that] \mid []. np \rightarrow d \mid prop \mid pn. n \rightarrow [justice]. v \rightarrow [saw] \mid [was]. prop \rightarrow ['Jules']. adj \rightarrow [important]. pn \rightarrow [that].
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The three parts carry, respectively, 30%, 30%, 40% of the marks.

- 2a Explain, with examples, why commercial grammar checkers have not achieved the same level of use as spell checkers. What improvements in their performance would be required to make them useful to the average writer? Give **two** suggestions of measures that could be taken.
- b Why have statistical and rule-based methods traditionally been seen as opposing approaches in natural language processing? Describe how this situation has changed in the last few years and how the two approaches can be combined.
- Distinguish the aspects of a language known as morphology, syntax, semantics and pragmatics. Give examples of each and comment on the power of the formalism required to represent them.
- b Describe a general method for handling quantifiers in the lexicon and show carefully how they combine with the rest of the sentence to generate a logical structure.
- c What syntactic and semantic constraints would be used to identify anaphoric pronouns both within and between sentences. Illustrate your answer with examples.

- What are the advantages of unification grammar (UG) compared with contextfree grammars and compared with the simpler DCGs? Show briefly how to represent a UG grammar in Prolog and the steps necessary to convert it to Prolog.
- b Given the following unification grammar:



show a complete parse and syntactic structure for the following sentence:

he brought two cases to them

The two parts carry, respectively, 60%, 40% of the marks.

End of paper