

## COMPUTER SCIENCE TRIPOS Part IB – 2015 – Paper 3

### 3 Compiler Construction (TGG)

Consider the following context-free grammar of expressions

$$E ::= n \mid (E, E)$$

where  $n$  ranges over integers.

- (a) Present a right-most derivation of the expression  $((21, 18), 17)$ . [2 marks]
- (b) List the LR(0) items for this grammar. [2 marks]
- (c) Describe the states of the deterministic finite automata associated with an LR(0) parser for the grammar presented above. Explain your method of constructing these states. [4 marks]
- (d) Describe the calculation of the *goto* function associated with an LR(0) parser for the grammar above. How is the *goto* function used by the parser? [4 marks]
- (e) Carefully describe the LR(0) parsing associated with your derivation in (a). That is, show each transition of the parser and how it performs *shift* and *reduce* operations. [8 marks]