

## COMPUTER SCIENCE TRIPOS Part IB – 2014 – Paper 6

### 1 Complexity Theory (AD)

- (a) Give the two definitions of the complexity class **NP**, one using the term Turing machine and one using the term verifier. [4 marks]
- (b) For each of the following statements, state whether it is true, false or unknown. In each case, give justification for your answer. In particular, if the truth statement is unknown, state any implications that might follow from it being true or false. [2 marks each]
- (i)  $3\text{SAT} \leq_P \text{CLIQUE}$
- (ii)  $\text{TSP} \in \text{P}$
- (iii)  $\text{NL} \subseteq \text{P}$
- (iv)  $\text{PSPACE} \neq \text{NPSpace}$
- (c) Let  $\Sigma = \{0, 1\}$ . Prove that  $\emptyset$  and  $\{0, 1\}^*$  are the only languages in **P** which are not complete for **P** with respect to polynomial-time reductions. [8 marks]