

COMPUTER SCIENCE TRIPOS Part IB – 2012 – Paper 6

1 Complexity Theory (AD)

(a) Suppose L_1 and L_2 are languages in **P**. What can you say about the complexity of each of the following? Justify your answer in each case.

(i) $L_1 \cup L_2$. [3 marks]

(ii) $L_1 \cap L_2$. [3 marks]

(iii) The complement of L_1 . [2 marks]

(b) Suppose L_1 and L_2 are languages in **NP**. What can you say about the complexity of each of the following? Justify your answer in each case.

(i) $L_1 \cup L_2$. [3 marks]

(ii) $L_1 \cap L_2$. [3 marks]

(iii) The complement of L_1 . [2 marks]

(c) Give an example of a language in **NP** that is *not* **NP**-complete and prove that it is not. [4 marks]