COMPUTER SCIENCE TRIPOS Part IB – 2025 – Paper 6

2 Complexity Theory (tg508)

(*a*) Define the class BPP formally. [2 marks]

(*b*) Show that the standard choice of error probability bound in the definition of BPP can be reduced to an exponentially small error. [4 marks]

(*c*) Suppose we set the error probability bound to only require less than 1/2 (i.e., success probability at least 1/2) in the above definition. Would that change the resulting complexity class? [6 marks]

(*d*) Prove that $\mathsf{BPP} \subseteq \mathsf{P/Poly}$. [4 marks]

(*e*) Is $\mathsf{BPP} = \mathsf{P/Poly}$? Justify your answer. [4 marks]