2004 Paper 6 Question 12

Complexity Theory

(*a*) Define a one-way function. [4 marks]

(*b*) Explain why the existence of one-way functions would imply that P≠NP. [7 marks]

(*c*) Recall that `Reach` is the problem of deciding, given a graph G a source vertex s and a target vertex t, whether G contains a path from s to t; and `Sat` is the problem of deciding whether a given Boolean formula is satisfiable.

For each of the following statements, state whether it is true or false and justify your answer.

(*i*) If `Reach` is NP-complete then P=NP. [3 marks]

(*ii*) If `Reach` is NP-complete then NP≠PSPACE. [3 marks]

(*iii*) If `Sat` is PSPACE-complete then NP=PSPACE. [3 marks]