

COMP362 WINTER 2016 ASSIGNMENT 3

Due at 14:30 on March 15th 2016

- 1) An instance of 7-Colourability consists of a graph G . We are asked to determine if we can colour its vertices using the integers 1 through 7 so none of its edges are monochromatic. Show 7-Colourability is NP-complete.
- 2) A triple system consists of a vertex set V and a set T of triples. An instance of Bipartite Triple System consists of a triple system. We are asked to determine if we can colour its vertices using the integers 1 and 2 so none of its triples are monochromatic. Show Bipartite Triple System is NP-Complete.
- 3) For any fixed integer B , an Instance of B -integer Cutting Stock is a cutting stock instance where the raw width and all the final widths are integer and there are at most B different final widths.
 - (a) Show that for every B , there is a pseudo-polynomial time algorithm to solve the fractional relaxation of B -integer Cutting Stock.
 - (b) Show that for every B and every $\epsilon > 0$, there is a pseudo-polynomial time $(1 + \epsilon)$ -approximation algorithm for the B -integer Cutting Stock instance.
- 4) For any fixed integer B , an Instance of $(1$ to $B)$ Cutting Stock is a cutting stock instance where all the final widths are integers between 1 and B .
 - (a) Show that for every B , there is a polynomial time algorithm to solve the fractional relaxation of $(1$ to $B)$ Cutting Stock.
 - (b) Show that for every B and every $\epsilon > 0$, there is a polynomial time $(1 + \epsilon)$ -approximation algorithm for $(1$ to $B)$ -Integer Cutting Stock.

Please email your solutions to yuditskyl@gmail.com

