Q2. Alg VI

$$\min \sum_{u \in V \text{ if } x_u \geq 1/3} x_u$$

s.t. $x_u + x_v + x_w \geq 1 \quad \forall \Delta(u,v,w) \in G$

$0 \leq x_u \leq 1 \quad \forall x_u \in V$

Σx 

opt(LP) = 7/3 set every V: 0 or 1

opt(ILP) = 1

Let x^* be opt soln of linear prog

let $\hat{x}_u \begin{cases} 1, \text{if } x^*_u \geq 1/3 \\ 0, \text{if } x^*_u < 1/3 \end{cases}$

by $x_u + x_v + x_w \geq 1$ $x_u, x_v \geq 1/3$, or $x_w, x_v \geq 1/3$.

or $x_u, x_w \geq 1/3$

At least one or two of every $\hat{x}_u$ or $\hat{x}_v$ or $\hat{x}_w$ is 1

$\text{cost} = \sum_{u \in V} \hat{x}_u$ compare to cost of $x^* \leq 3 \sum_{u \in V} x^*_u$

because $\hat{x}_u \leq 3 x^*_u$

Output $\leq 3 \cdot$ Opt(LP) ≤ 3 (Min V removed for no Δ)

$7/3 \leq 3 \cdot 1 \leq 3$

Therefore 3 factor