

**Week 12 Tutorial Session**

(1) Consider the language

$$L = \{\langle G_1, G_2 \rangle \mid G_1, G_2 \text{ are context-free languages and } L(G_1) = L(G_2)\}$$

- (a) Show that  $L$  is undecidable.
- (b) What is  $\bar{L}$ ? Show that  $\bar{L}$  is recognizable.
- (c) Show that  $L$  is unrecognizable.

(2) Consider the following language:

$$L = \{\langle M \rangle \mid M \text{ does not accept } \varepsilon\}.$$

Prove that  $L$  is unrecognizable by *directly reducing* from  $\bar{A}_{\text{TM}}$ , where

$$\bar{A}_{\text{TM}} = \{\langle M, w \rangle \mid \text{Turing machine } M \text{ rejects or infinite-loops on input } w\}$$

is a known unrecognizable language.