Problem 1. We call a boolean function $f : \{0, 1\}^k \rightarrow \{0, 1\}$ symmetric if $f(x_1, x_2, \ldots, x_k)$ depends only on $\sum_{i=1}^{k} x_i$. How many symmetric boolean functions of $k$ variables are there?

Solution. $2^{k+1}$. 

Problem 2. It is known that the language

$$\{M : M \text{ halts on all inputs}\}$$

is undecidable. Prove or disprove that the following restricted language

$$L_{1000} = \{M : M \text{ halts on all inputs and } M \text{ is at most } 1000 \text{ bits long}\}$$

is undecidable.

Proof. There exists a TM that keeps all the $M \in L$ in its states (which is finite in number) and tests if the input is one of them. Therefore, $L_{1000}$ is decidable.