1. (25 points) Let $X$ be a finite set of positive integers. We say $X$ is good if and only if for every nonempty set $Y$ contained in $X$, the sum of the members of $Y$ is not divisible by 10. What is the largest number $n$, such that there is a good set $X$ with exactly $n$ members? Give an example of a good set of that size. Explain why there is no larger good set.

2. (25 points) Is the conjunction of the following schemata truth-functionally satisfiable? Explain your answer.

$$\bullet \ (p_{11} \lor p_{12}) \land (p_{21} \lor p_{22}) \land (p_{31} \lor p_{32})$$
$$\bullet \ p_{11} \supset \neg (p_{21} \lor p_{31})$$
$$\bullet \ p_{21} \supset \neg (p_{11} \lor p_{31})$$
$$\bullet \ p_{31} \supset \neg (p_{11} \lor p_{21})$$
$$\bullet \ p_{12} \supset \neg (p_{22} \lor p_{32})$$
$$\bullet \ p_{22} \supset \neg (p_{12} \lor p_{32})$$
$$\bullet \ p_{32} \supset \neg (p_{12} \lor p_{22})$$

3. (25 points) How many truth assignments to the sentence letters $p_1, \ldots, p_5, q_1, \ldots, q_5$ satisfy the following schema?

$$(p_1 \supset q_1) \land \ldots \land (p_5 \supset q_5)$$

4. (25 points) Recall that $\oplus$ represents exclusive disjunction. How many truth assignments to the sentence letters $p_1, \ldots, p_5$ satisfy the following schema?

$$(((p_1 \oplus p_2) \oplus p_3) \oplus p_4) \oplus p_5)$$