Assignment 2 Written Solution

Part a

We define the following propositional variables:

- N : The system is operating normally.
- K : The kernel is functioning.
- M : The system is in multiuser state.
- I : The system is in interrupt mode.

Part b

Translate each system specification into propositional logic:

- $N \Rightarrow K$
- $M \Leftrightarrow N$
- $\neg M \Rightarrow I$
- $\neg K \vee I$
- $\neg I$

Part c

For the system to be consistent, there must be a way for all specifications to be simultaneously true. We attempt to find a truth assignment to the propositional variables that results in all the specifications being true:

- If $\neg I$ is true, then I must false.
- Then, for $\neg K \vee I$ to be true, $\neg K$ must be true and so K must be false.
- Also, for $\neg M \Rightarrow I$ to be true, $\neg M$ must be false which means M must be true.
- For $M \Leftrightarrow N$to be true, N must also be true.

At this point, we have determined the truth values that the propositional variables must have for the last specifications to be true (and these are the only possible truth values that make the these four specifications simultaneously true). However, the first specification, $N \Rightarrow K$, is false using these truth values and thus we conclude that we cannot find a truth assignment to the propositional variables that makes all the specifications simultaneously true. Thus, the system is inconsistent.
