Section 1.2

Problem no. 10

Are these system specifications consistent? "Whenever the system software is being upgraded, users cannot access the file system. If users can access the file system, then they can save new files. If users can not save new files, then the system software is not being upgraded."

Answer:

To determine whether these specifications are consistent, we first express them using logical expressions. Let p denote "The system software is being upgraded", let q denote "Users can access the file system and let r denote "They can save new files." The specifications can be written as

$$p \rightarrow \neg q, \quad q \rightarrow r, \quad \neg r \rightarrow \neg p.$$

from the truth table:

P	q	r	¬p	¬q	¬r	p→¬q	q→r	¬r→p
T	T	T	F	F	F	F	T	T
T	T	F	F	F	T	F	F	T
T	F	T	F	T	F	T	T	T
T	F	F	F	T	T	T	T	T
F	T	T	F	F	F	T	T	T
F	T	F	T	F	T	T	F	F
F	F	T	T	T	F	T	T	T
F	F	F	F	T	T	T	T	F

We can see that, an assignments of truth values that makes all three specifications true <u>must have</u>

① p and r are true and q is false.

② p is true and q and r are false.

③ P is false and q and r are true.

④ p and q are false and r is true.

$q \leftrightarrow p r$, $\sqrt{\quad} r \leftarrow r$, $r \leftarrow q r$.