PES University, Bangalore

Department of Computer Science and Engineering

Automata Formal Languages & Logic

Q&A for Propositional Logic- Knowledge Base AND Simple Inference Procedure

Problem:

1. **Convert the following verbal argument to the propositional form: -**
   Russia was a superior power, and either France was not strong or Napoleon made an error. Napoleon did not make an error, but if the army did not fail, then France was strong. Hence the army failed and Russia was a superior power.

Solution:

Let:

A : Russia was a superior power
B: France was strong
C: Napoleon made an error
D: The army failed

Propositional Form is

$A \wedge (B' \vee C) \wedge C' \wedge (D' \rightarrow B) \rightarrow (D \wedge A)$

2. **Use a truth table to analyze the arguments.**

a. If there is a cream, then I will drink coffee.
b. If there is a donut, then I will drink coffee
c. There is no cream and there is a donut

Infer the conclusion

I drink coffee.

Solution:-

Let:
P : There is a cream

Q: I drink coffee

R: There is a donut

Write all the statement in the form of proposition logic

$P \rightarrow Q$
$R \rightarrow Q$
$\sim P \wedge R$
To Infer Q

Prove $(P \rightarrow Q) \wedge (R \rightarrow Q) \wedge (\sim P \wedge R) \wedge Q$ is valid

P	Q	R	$P \rightarrow Q$	$R \rightarrow Q$	$\sim P$	$\sim P \wedge R$	$(P \rightarrow Q) \wedge (R \rightarrow Q) \wedge (\sim P \wedge R)$ LET This is **A**	**A**$\rightarrow$Q
T	T	T	T	T	F	F	F	T
T	T	F	T	T	F	F	F	T
T	F	T	F	F	F	F	F	T
T	F	F	F	T	F	F	F	T
F	T	T	T	T	T	T	T	T
F	T	F	T	T	T	F	F	T
F	F	T	T	F	T	T	F	T
F	F	F	T	T	T	F	F	T

$(P \rightarrow Q) \wedge (R \rightarrow Q) \wedge (\sim P \wedge R) \wedge Q$ is true for all the combination of values, hence the argument is valid and infer Q.