Informatics 1A: Assessed Assignment 2

Propositional Logic

Due noon 14 October 2005

Please complete this assignment sheet and return it to the ITO by the date shown above. Please write as legibly as possible. Maybe practice on another sheet of paper first.

1. Please write your name and matriculation number below:

2. Here are some propositional symbols, together with the English sentences they stand for:

SYMBOL	ENGLISH	T/F?
A	*Martin Scorsese directed Apocalypse Now*	
B	*Marlon Brando starred in Apocalypse Now*	
C	*Diane Keaton starred in The Godfather*	
D	*Diane Keaton died in 2004*	
E	*Marlon Brando died in 2004*	
F	*Diane Keaton is married to Marlon Brando*	
G	*Apocalypse Now is about the Vietnam War*	
H	*Marlon Brando starred in The Godfather*	
J	*Diane Keaton is nine years old*	
K	*Diane Keaton has co-starred with Marlon Brando*	

Recall that every expression of propositional logic is either **true** or **false**, and no expression can be both true and false. Using the Internet Movie Database, determine whether each propositional symbol above is true (T) or false (F). Write your answer in the appropriate box in the third column.

3. Some of the following are well-formed expressions of propositional logic and the others are just symbol soup. Decide which is which and write your answer in the appropriate box.

EXAMPLE	GOOD/BAD?
$A \rightarrow \neg B$	
$F \neg \vee D$	
$\neg A$	
$\neg\neg(G \,\&\, \neg\neg(C \leftrightarrow H))$	
$(A \rightarrow B) \rightarrow \neg(\neg F \,\&\, \neg B)$	
$H \vee \neg J \,(\leftrightarrow \neg\neg E)$	
$(G \leftrightarrow F) \models \neg(F \,\&\, \neg A)$	
$D \vee \neg(A \rightarrow \neg(C \rightarrow \neg F))$	
H	
$\rightarrow K$	

4. Translate the following expressions of propositional logic into *natural-sounding* English, assuming the key in question 2. Write your answer in the box under each expression.

(a) $C \,\&\, H$

(b) $B \,\&\, \neg\, H$

(c) $D \rightarrow \neg F$

(d) $(H \,\&\, C) \rightarrow K$

(e) $F \rightarrow \neg(D \vee J)$

5. Translate the following English sentences into propositional logic, using the appropriate propositional symbols from question 2). Write your answers in the appropriate boxes.

   (a) *Martin Scorsese directed the Vietnam War film Apocalypse Now, starring Marlon Brando*

   (b) *Marlon Brando co-starred with Diane Keaton in The Godfather*

   (c) *Neither Marlon Brando nor Diane Keaton died in 2004*

   (d) *Marlon Brando, who is married to Diane Keaton, was directed by Martin Scorsese in Apocalypse Now*

   (e) *If Diane Keaton is nine years old, then she didn't die last year, Marlon Brando isn't her husband and she didn't star in the Godfather*

6. The truth or falsity of a complex expression of propositional logic is a function of the truth/falsity of the propositional symbols it is made out of. Based on the answers you gave in question 2, and your knowledge of the truth tables for negation, conjunction, disjunction, implication and equivalence, work out whether the following expressions are true or false. Please present your answers as in example (a).

   (a) $(C \,\&\, \neg G) \rightarrow J$

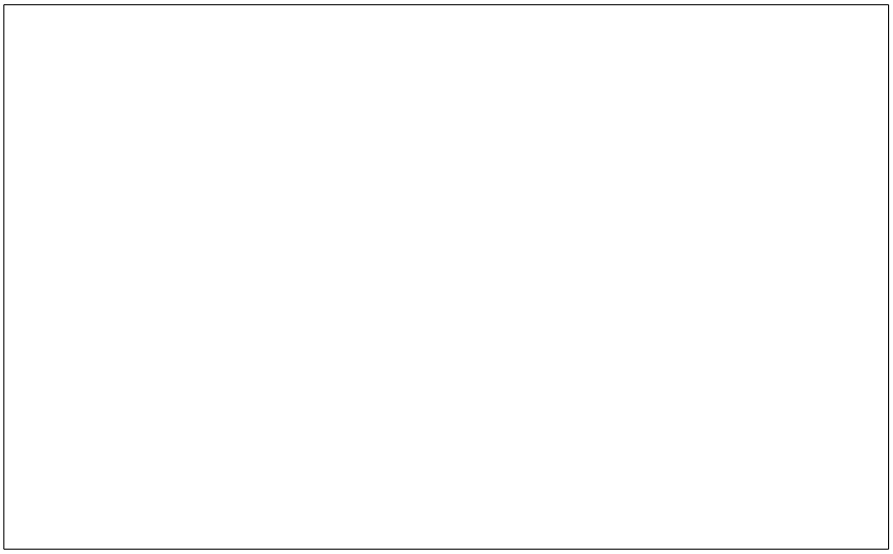
   $$(C \,\&\, \neg G) \rightarrow J$$
   $$(true \,\&\, \neg true) \rightarrow false$$
   $$(true \,\&\, false) \rightarrow false$$
   $$false \rightarrow false$$
   $$true$$

   (b) $D \rightarrow \neg F$

   (c) $F \rightarrow \neg(D \vee E)$

(d) $(H \rightarrow \neg E)$ & $(B \leftrightarrow \neg D)$

(e) $(K \ \& \ \neg F) \rightarrow \neg(F \vee \neg\neg(A \,\&\, B))$



This assignment was written by Mark.McConville@ed.ac.uk