1. (20 marks)   2 @

   True or false?
   Circle 'T' if the statement is true.
   Circle 'F' if the statement is false.
   Assume that φ is a WFF of SL.

   (T) F φ may contain exactly 3 symbols.

   (T) F   All arguments are either valid or unsound.

   T (F)   All good arguments are sound arguments.

   T (F) φ might not be an expression of SL.

   T (F)   If φ contains exactly 5 symbols then φ contains a two-place connective.

   (T) F   The antecedent of "$(D \rightarrow (C \vee D))$" is "D".

   (T) F   The scope of "$\vee$" in "$\sim(A \vee B)$" is "$(A \vee B)$".

   T (F)   The word "bank" is not lexically ambiguous.

   T (F)   Logic is a science which tells us how people actually reason.

   T (F)   There is a valid argument with a hidden assumption and a true conclusion

                                                              /20

2. (5 marks)   1 @

   Circle each expression of SL below:

   $((C \rightarrow A)\&A)$

   $C\&D$

   $(((A \leftrightarrow A) \leftrightarrow (\sim B \vee A)) \vee \sim(B \leftarrow C)))$

   $\sim(\sim$

   $((C\&A) \vee \sim B)$

                                                              /5

2

3. *Make a truth table for each of the following WFFs of SL.* (20 marks)

  a. $(B \vee (B \to B))$

  T T T T T
  F T F T F

  b. $((A\&B) \leftrightarrow \sim A)$

  T T T F F
  T F F T F
  F F T F T
  F F F F T

  c. $((A\&B) \to (A \vee B))$

  T T T T T
  T F F T
  F F T T
  F F F T

  d. $((A\&C) \leftrightarrow (C \vee B))$

  T T T T T T T
  T F F F F T T
  T T T T T T F
  T F F T F F F
  F F T F T T T
  F F F F F T T
  F F T F T T F
  F F F T F F F

  e. $((A \leftrightarrow \sim B) \vee \sim C)$

  T F F T F F T
  T F F T T T F
  T T T F T F T
  T T T F T T F
  F T F T T F T
  F T F T T T F
  F F T F F F T
  F F T F T T F

/20

4. (16 marks)

4 @

Fill in the blanks with a WFF of SL to make correct truth tables.

Any WWF logically equivalent to the suggested answer will do.

a.

A	B	~(~A & B) / (B→A)
T	T	T
T	F	T
F	T	F
F	F	T

b.

A	B	C	(((A↔C) & ~B) ∨ (~A & ~(B↔C)))
T	T	T	F
T	T	F	F
T	F	T	T
T	F	F	F
F	T	T	F
F	T	F	T
F	F	T	T
F	F	F	T

c. For this one, don't write "$(B \lor \sim B)$" or "$(\sim B \lor B)$".

B	(B→B)
T	T
F	T

d.

A	B	C	$((\sim(A \Leftrightarrow B) \not{} \land C) \lor (\sim A \land b))$
T	T	T	F
T	T	F	F
T	F	T	F
T	F	F	T
F	T	T	F
F	T	F	T
F	F	T	T
F	F	F	T

/16

5. (12 marks) *Suppose that "#" is a new connective added to SL.*
Here is the truth table for "$((A\#B)\#A)$" :

A	B	$((A\#B)\#A)$
T	T	T
T	F	F
F	T	T
F	F	T

If all correct , 12

3 correct , 6

2 , 4

1 , 2

0 , 0

Write down a correct truth table for "$(A\#B)$":

T F T
T T F
F T T
F T F

/12

5

6. (10 marks) ≥ @

Translate the following statements into SL, preserving as much structure as possible. Be sure to write down your translation scheme.

(a) If I swim I will float, but otherwise I'll be home later.

$$((S \to F) \quad \lor \quad L) \qquad \text{or}$$
$$((S \to F) \quad \lor (\lnot(S \to F) \to L)) \quad \text{or}$$
$$((S \to F) \quad \lor (\lnot(S \to F) \,\&\, L))$$

(b) Jason will not meet you, unless you are late.

$$(\lnot M \quad \lor \quad L)$$
$$(M \quad \to L)$$

(c) Either Jason or Lee ate lunch.

$$(J \lor L)$$

(d) Provided that Lee comes, I won't eat and I won't drink.

$$(L \quad \to \quad (\lnot E \,\&\, \lnot D)) \quad \text{or}$$
$$((\lnot E \,\&\, \lnot D) \to L)$$

(e) If you think I am crazy, then you should go there only if you are not afraid.

$$(C \quad \to \quad (G \to \lnot F))$$

/10

6

7. (5 marks)

1. Write down an unsound valid argument with exactly one premise, and where the conclusion is different from the premise.

3 pts

$$\frac{\text{All pigs are cockroaches.}}{1 + 1 = 2}$$

2. Explain why your argument is unsound.

2 pts

B/c the premise is false.

/5

8. (12 marks)

   Assume that each of the following three statements is true:

   $D : I$ will become a doctor. $I : I$ will learn Russian.

   If I will not become a doctor, then I will learn both Russian and Italian.

   I will learn Russian. $R : I$ will learn Russian

   Either I will become a doctor and I will learn neither Russian nor Italian, or I will not become a doctor and I will learn both Russian and Italian.

   1. *Translate each of the three statements into SL, preserving as much structure as possible. Be sure to write down your translation scheme.*

   2 @ HW‾

   $(D \rightarrow (R \mathbin{\&} I))$

   R

   $((D \mathbin{\&} (\sim R \mathbin{\&} \sim I)) \lor (\sim D \mathbin{\&} (R \mathbin{\&} I)))$

   2. *Will I become a doctor?*

   6 pts

   No.

/12

8