PHL 245 H1S

Test 1: Thursday, February 6, 2014

Aids: list of rules (given). No other aids allowed.

100 minutes.

NOTE:

It is a lengthy test. If you get stuck, it is important that you do as much as possible and go on to the next question.

Part marks will be given for all questions. When doing symbolizations and derivations, show the overall structure and as much work as possible even if you can't solve it completely.

There are five pages with questions (pages 2-6). Pages 7 and 8 are for rough notes or in case you need extra space.

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86½

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Signature: Rui Qiu

1. Consider the following argument: 10 %

In my logic class, I learned that every sound argument is valid. I also found out that if the premises of an argument are inconsistent then the argument cannot be sound. This led me to the see that every sound argument has a true conclusion. That's because in any valid argument, either the premises are inconsistent or the conclusion is true.

a) Extract the argument from this passage and put it in standard form.

Every sound argument is valid.
If the premises of an argument are inconsistent then the argument cannot be sound. $S \to V$
In any valid argument, either the premises are inconsistent or the conclusion is true. $P \to \sim S$
$V \wedge (P \vee T)$
∴ Every sound argument has a true conclusion. $S \to T$

10

b) Is the argument deductively valid? (circle) **YES** NO

c) Are any of the premises false? (circle) **YES** NO

If 'yes', indicate which one(s). Third one, "In any valid argument, either ..., ~~or~~ or ...".

d) Is the conclusion true? (circle) **YES** NO

e) Is the argument sound? (circle) YES **NO**

2. Determine whether the following sentences are in official notation; informal notation; or not well-formed (circle correct answer).

If it is in official or informal notation, indicate the main logical operator (circle, use an arrow, etc.)

If it is not well-formed, indicate the problem (circle, use an arrow, etc.) (6 %)

2 a) $(\sim\sim(\sim P \to T) \vee (V \leftrightarrow Z) \vee (W \wedge \sim R))$ Official notation — **Informal notation** — Not well-formed

2 disjunctions here, need brackets like (( )v( ))v( )

1½ b) $(\sim(\sim(Q \wedge W) \to \sim P) \leftrightarrow (T \vee \sim S))$ **Official notation** — Informal notation — Not well-formed

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Name: Rui Qiu Student Number 999292509

P: Patty is on the team.
Q: Quinn is on the team.
R: Rylan is on the team.
S: Somebody will quit the team.
T: Tom is team captain.
W: Patty gets injured.
Y: Rylan quits the team.
Z: The team will win.

3. Use the abbreviation scheme above to symbolize the following: (40%: 8% × 5)

a) If it's not the case that if Patty doesn't get injured she's on the team, then either Quinn or Rylan is on the team.

$\sim(\sim W \rightarrow P) \rightarrow (Q \vee R)$

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b) Quinn is on the team only provided that Rylan quits, but for the team to win it is necessary that nobody quits.

$(Q \rightarrow Y) \wedge (Z \rightarrow \sim S)$

8

c) Assuming that neither Quinn nor Patty is on the team, Rylan's quitting the team is sufficient for Tom to be team captain.

$(\sim Q \wedge \sim P) \rightarrow (Y \rightarrow T)$

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d) Rylan and Quinn aren't both on the team unless Tom is captain, and in that case, the team will win if, but only if, Patty doesn't get injured.

$(\sim(R \wedge Q) \vee T) \wedge (\overset{T \rightarrow}{Z} \leftrightarrow \sim W)$

6

e) Using the abbreviation scheme above, provide an idiomatic English sentence for the following:

$\sim((P \wedge Q) \vee (Q \wedge R) \vee (R \wedge P)) \rightarrow \sim T$

8

If it's not the case that two ~~exactly~~ out of Patty, Quinn and Rylan are on the team, then Tom isn't ~~the~~ team captain.

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4. Provide a derivation to show that the following is a valid argument. 14 %
Use **ONLY** the 10 basic rules: **MP, MT, DN, R, ADJ, S, ADD, MTP, BC, CB**

$\sim P \vee Q. \quad (S \wedge Q) \to (W \leftrightarrow \sim T). \quad (X \vee S) \to \sim W. \quad \therefore\ (P \wedge S) \to T$

1	~~Show~~ $(P \wedge S) \to T$	
2	$P \wedge S$	ass cd
3	~~Show~~ T	
4	$\sim T$	ass id
5	P	2 sl
6	S	2 sr
7	$\sim\sim P$	5 dn
8	Q	pr1 7 mtp
9	$S \wedge Q$	6 7 adj
10	$W \leftrightarrow \sim T$	pr2 9 mp
11	$\sim T \to W$	10 bc
12	W	4 11 mp
13	$\sim\sim W$	12 dn
14	$\sim(X \vee S)$	pr3 13 mt
15	$X \vee S$	6 add
16		14 15 id
17		3 cd
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5. Provide a derivation to show that the following theorem is valid.
Use **ONLY** the 10 basic rules: **MP, MT, DN, R, ADJ, S, ADD, MTP, BC, CB.**   15 %

$$\therefore \sim(P \to Q) \to (\sim(R \vee S) \to (S \leftrightarrow \sim P))$$

1	Show $\sim(P\to Q)\to(\sim(R\vee S)\to(S\leftrightarrow\sim P))$	
2	$\sim(P\to Q)$	ass cd
3	Show $\sim(R\vee S)\to(S\leftrightarrow\sim P)$	
4	$\sim(R\vee S)$	ass cd
5	Show $S\leftrightarrow\sim P$	
6	Show $S\to\sim P$	
7	S	ass cd
8	Show $\sim P$	
9	P	ass id
10	S	7 R
11	$R\vee S$	10 add
12	$\sim(R\vee S)$	4 R
13		11, 12 id
14	Show $\sim P\to S$	
15	$\sim P$	ass cd
16	Show S	
17	$\sim S$	ass id
18	Show $P\to Q$	
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20		6 14 cb
21		~~20~~ 5 cd
22		3 cd
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6. Show that the following is a valid argument (use any of the rules): 15 %

$\sim(W \leftrightarrow \sim Y)$. $\sim(\sim Q \vee X) \vee \sim Y$. $\sim(\sim T \rightarrow Y) \rightarrow W$. $\sim(Q \leftrightarrow X) \rightarrow \sim(Z \vee \sim P)$

$\therefore P \vee T$

1	Show $P \vee T$	
2	$W \leftrightarrow Y$	pr1 nb
3	$\sim(\sim Q \vee X) \wedge Y)$	pr2 dm
4	$(\sim T \rightarrow Y) \vee W$	pr3 cdj
5	$(Q \leftrightarrow X) \vee \sim(Z \vee \sim P)$	pr4 cdj
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1	~~Show~~ P∨T	
2	~~Show~~ ~W → (P∨T)	
3	~W	ass ~~d~~ cd
4	W ↔ Y	pr1 nb
5	~~Y → W	4 bc
6	~Y	3 5 mt
7	(~T → Y)∨W	pr3 cdj
8	~T → Y	3 7 mtp
9	~~T	6 8 mt
10	T	9 dn
11	P∨T	10 add
12		11 cd
13	~~Show~~ W → (P∨T)	
14	W	~~4 bc~~ ass cd
15	W → Y	4 bc
16	Y	14 15 mp
17	~~Y	16 dn ~~16 pr2 mtp~~
18	~(~Q∨X) ~~Q	17 pr2 mtp
19	~~~Q∨X~~ Q∧~X	~~18 dn~~ 18 dm
20	Q	19 sl
21	~X	19 sr
22	~~Show~~ ~(Q↔X)	
23	Q↔X	ass id
24	Q→X	23 bc
25	Q	20 r
26	X	24 25 mp
27	~X	21 r
28		26 27 id
29	(Q↔X)∨~(Z∨~P)	pr4 cdj
30	~(Z∨~P)	22 29 mtp

14

14

31	$\sim Z \wedge P$	30	dm
32	P	31	sr
33	PVT	32	add
34		33	cd
35	PVT	2, 13	SC
		35	dd