COL703 Quiz 1

Sreemanti Dey

TOTAL POINTS

2 / 3

QUESTION 1

1 1 / 1

+ **0.5 pts** Partially correct
✓ + **1 pts** Correct
+ **0 pts** Incorrect
+ **0 pts** Not attempted

QUESTION 2

2 1 / 1

+ **0.5 pts** Partially Correct
✓ + **1 pts** Correct
+ **0 pts** Incorrect / Not attempted

QUESTION 3

3 0 / 1

+ **1 pts** Correct
+ **0.5 pts** Partially Correct
✓ + **0 pts** Incorrect/Not attempted

② 1+1+0

Quiz 1 (*Aug 18, Marks: 3, Duration: 20 mins*) **COL703, Aug-Nov 2022**

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1. **[1 marks]** Is it true that we can transform any proof of $\phi_1, \phi_2, \ldots, \phi_n \vdash \psi$ into a proof of the theorem $\vdash \phi_1 \to (\phi_2 \to (\phi_3 \to (\ldots \to (\phi_n \to \psi) \ldots)))$? If not, explain why. If yes, sketch the transformation.
2. **[1 marks]** Give a natural deduction proof of validity of the sequent $(p \vee q) \vee r \vdash p \vee (q \vee r)$.
3. **[1 marks]** Give a natural deduction proof of the law of excluded middle using basic proof rules.

2. $(p \vee q) \vee r \vdash p \vee (q \vee r)$

1.	$(p \vee q) \vee r$	premise
2.	$p \vee q$	assume
3.	p	assume
4.	$p \vee (q \vee r)$	$\vee i_1$ 3
5.	q	assume
6.	$(q \vee r)$	$\vee i_1$ 5
7.	$p \vee (q \vee r)$	$\vee i_2$ 6
8.	$p \vee (q \vee r)$	$\vee e$
9.	r	assume
10.	$q \vee r$	$\vee i_2$ 9
11.	$p \vee (q \vee r)$	$\vee i_2$ 10
12.	$p \vee (q \vee r)$	$\vee e$

proved.

1. Yes, we can.

The transformation is

consider ϕ_i's as assumptions in the proof of $\vdash \phi_1 \to (\phi_2 \to (\cdots (\phi_n \to \psi)))$ instead of premises as in proof of $\phi_1, \phi_2 \ldots \phi_n \vdash \psi$

1. ϕ_1 assume

2. ϕ_2 assume

ϕ_n

ψ

$\phi_n \to \psi$ $\quad \to_i$ → from $\phi_1, \phi_2 \ldots \phi_n \vdash \psi$. ϕ_n T implies ψ is True

$\phi_{n-1} \to (\phi_n \to \psi)$

$\vdots$

$\phi_1 \to (\phi_2 \to \ldots (\phi_n \to \psi) \ldots) \ldots)$

3. $\vdash p \vee \neg p$

p

$\neg p$

$\perp$

$p \vee \neg p$

$\neg p$

p

$\perp$

$p \vee \neg p$

1.	$p \wedge \neg p$		
2.	p	$\wedge e_1$	1
3.	$\neg p$	$\wedge e_2$	1
4.	$\perp$	$\perp_i$	
5.	$p \vee \neg p$	$\perp e$	