Quiz 10

Deadline	Monday, 28 October 2019 at 4:00PM
Latest Submission	*no submission yet*
Maximum Mark	5

Question 1 (1 mark)

Assume $\{p,q\} \subseteq$ Prop. Which of the following are well-formed formulas under the strictest definition (i.e. no conventional omissions)? Select all that apply.

(a) ☐	$\neg(p \wedge q)$
(b) ☐	$p \rightarrow \neg\top$
(c) ☐	$((p \wedge q) \vee (q \wedge \bot))$
(d) ☐	$\neg\neg\neg\bot$
(e) ☐	$(\bot \vee (\neg\top))$

Question 2 (1 mark)

The *dual* of a propositional formula is defined recursively as follows. If PF is the set of propositional formulas over Prop, we define dual:PF→PF as follows:

- $\text{dual}(\top) = \bot$; $\text{dual}(\bot)=\top$;
- $\text{dual}(p) = p$ for all $p \in \text{Prop}$
- $\text{dual}(\neg\varphi) = \neg\ \text{dual}(\varphi)$;
- $\text{dual}(\varphi\wedge\psi) = (\text{dual}(\varphi) \vee \text{dual}(\psi))$
- $\text{dual}(\varphi\vee\psi) = (\text{dual}(\varphi) \wedge \text{dual}(\psi))$

Let $\varphi = ((p\wedge\neg q)\vee\top)$

What is $\text{dual}(\varphi)$?

(a) ○	$((\neg p\vee q)\wedge\bot)$
(b) ○	$((p\vee\neg q)\wedge\bot)$
(c) ○	$((\neg p\wedge q)\vee\top)$

(d)	$\perp$
(e)	None of the above

Question 3 (1 mark)

As before, let PF be the set of well-formed formulas over Prop. Define flip:PF→PF recursively as follows:

- flip($\top$) = $\top$; flip($\perp$)=$\perp$;
- flip(p) = ¬p for all p∈Prop
- flip(¬φ) = ¬flip(φ);
- flip(φ∧ψ) = (flip(φ) ∧ flip(ψ))
- flip(φ∨ψ) = (flip(φ) ∨ flip(ψ))

Let φ =((p∧¬q)∨$\top$)

What is flip(φ)?

(a)	((¬p∨q)∧$\perp$)
(b)	((p∨¬q)∧$\perp$)
(c)	((¬p∧q)∨$\top$)
(d)	$\perp$
(e)	None of the above

Question 4 (1 mark)

Which symbol appears at the top of the parse tree for the formula:

φ =((p∧¬q)∨$\top$)

(a)	∨
(b)	∧
(c)	¬
(d)	$\top$
(e)	None of the above

Question 5 (1 mark)

Suppose v:Prop→$\mathbb{B}$ is defined as v(p) = true; v(q) = false.

Let φ =((p∧¬q)∨$\top$)

If we extend v to all propositional formulas as described in lectures, what is v(φ)?

(a)	True
(b)	False

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