Section: Master 1 SIGL

Faculty of Mathematics and Computer Science
Department of Computer Science

Formal Verification and Specification
Lab Session (TP) 03

1. **CTL formulas:**

   - Always, if a train passes, the gate is closed
   - Despite the current situation, I will eventually do a in the future.
   - It exists currently a choice, just after it I could eventually choose b
   - For all executions, every event p will be eventually followed by q .
   - For all executions, every event p will be eventually followed by q in an exact future.
   - Every q implies that p would be true, where p must not be preceded by r
   - I do not enter only if the crossing is free, and I will close the door once I'm not in the crossing.
   - If two processes are waiting infinitely often, they would be served the one after the other.

2. **CTL equivalence:**
   Express the equivalences for the following CTL formulae:

   - $AX\varphi$
   - $AF\varphi$.
   - $EF\varphi$
   - $AG\varphi$
   - $AG\phi 1U\phi 2$
   - $EG\varphi$

Answers

1. **CTL formulas:**
   - Always, if a train passes, the gate is closed
   - Despite the current situation, I will eventually do a in the future.
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   - For all executions, every event p will be eventually followed by q .
   - For all executions, every event p will be eventually followed by q in an exact future.
   - Every q implies that p would be true, where p must not be preceded by r
   - I do not enter only if the crossing is free, and I will close the door once I'm not in the crossing.
   - If two processes are waiting infinitely often, they would be served the one after the other.

   Answer:
   - $AGpasse \implies gate\_closed$
   - $AXEFa$
   - $EXEFb$
   - $AG(p \implies AFq)$
   - $AG(p \implies AXAFq)$
   - $AG(q \implies A(\neg rUp))$
   - $(\neg EF(enter \wedge \neg free)) \wedge (AG(enter \implies AF(\neg stay \wedge closed)))$
   - $A[GFatt1 \wedge GFatt2 \implies \neg F((s1 \wedge (\neg s2)Us1 \wedge s2) \vee ((\neg s1)Us2))]$

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   Answer:
   - $AX\varphi \equiv \neg EX\neg\varphi$
   - $AF\varphi \equiv \neg EG\neg\varphi$.
   - $EF\varphi \equiv EtrueU\varphi$
   - $AG\varphi \equiv \neg EF\neg\varphi$
   - $AG\phi1U\phi2 \equiv \neg((E(\phi1 \wedge \neg\phi2)U(\neg\phi1 \wedge \neg\phi2)) \vee (EG\neg\phi2))$
   - $EG\varphi \equiv \neg AF\neg\varphi$