

Roll No: _____

Instructions

- Answer the questions in the space provided in this sheet. If you run out of space, affix extra pages at the end. Clearly indicate question numbers and your roll number on each of the extra pages.
- You are encouraged to print the homework on both sides of a page (duplex mode).
- **Do *not* in any event copy solutions from internet, friends, or any other source.**

1. Consider a program f . In program verification, correctness of a program is often defined in term of a precondition and postcondition pair. Intuitively, precondition is a property of initial states of the program and postcondition is a property of final states of the program. Let us model operational semantics of f by a state transition system TS . Consider a set of atomic propositions $P = \{init, final, pre, post\}$ where $init$ and $final$ hold only at initial and final states respectively, and pre and $post$ respectively indicate that the precondition and the postcondition holds. We describe some correctness notions below.

- (a) (1 point) The program f is *totally correct* if the initial states satisfy the precondition and the program *terminates* with final states that satisfy the postcondition. Give an LTL formula using the set of atomic propositions P that captures total correctness.

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- (b) (1 point) The program f is *conditionally partially correct* if whenever the initial states satisfy the precondition, the final states satisfy the postcondition. However, the program may or may not terminate. Give an LTL formula using the set of atomic propositions P that captures this correctness and a counter-example (a transition system TS and a path π) that violates the formula.

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- (b) (1 point) Write an LTL formula to mean “once x becomes true, before it becomes false, r holds continuously”. Make sure that the formula holds for the state transition system TS .

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- (c) (1 point) Write a CTL formula for “there exists a path along which eventually globally x or r holds but not both”. Does this formula holds for the transition system TS ?

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Evaluation

Question:	1	2	3	4	Total
Points:	2	2	3	3	10
Score:					