Project 3 Requirements

Abstract

The objectives, requirements, and relevant information for the project are stated here. Submission of your files is done through the course website.

1 Purpose

The purpose of this project is for you to demonstrate the following:

Capabilities: Basic capabilities to (1) manipulate HOL terms by writing ML functional programs, (2) create a HOL theory and save theorems, and (3) document your HOL theory, as evidenced by:

- Code solutions to Exercises 7.3.1, 7.3.2, and 7.3.3, with session transcripts showing execution results of required test cases, explanations as required by each problem, and source code for each exercise in the appendix in a single file *chapter7Answers.sml*,
- A HOL theory *chapter8Theory* defined by *chapter8Script.sml* proving theorems as specified in Exercises 8.4.1, 8.4.2, and 8.4.3, and
- A pretty-printed report *chapter8Report.pdf* of *chapter8Theory* generated using *EmitTeX*.

Reproducible Proofs and Documentation (new): All your datatypes, definitions, theorems, and proofs are contained in HOL theories. All your theories are pretty-printed as stand-alone LaTeX reports.

- Your HOL theories must be built using *Holmake*
- Your pretty-printed HOL theories must reside in a subdirectory called HOLReports and be maintained using *make clean* and *make*

Use of Relevant Tools and Techniques: LaTeX, AUCTeX, emacs, ML, and HOL

Deliverables and Evidence: a pdf of your report with *all source files allowing others to reproduce your report, functional programs, and test results.*

2 Project Requirements

Your report shall have content similar to:

1. *projectReportExample.pdf* for Exercises 7.3.1, 7.3.2, and 7.3.3.
2. *exampleEmitTeXReport.pdf* for Exercises 8.4.1, 8.4.2, and 8.4.3.

3 Relevant Information

3.1 Specific Tests

Exercise 7.3.1 Test cases

```
andImp2Imp ``(p /\ q) ==> r``;
```

Exercise 7.3.2 Test cases

```
impImpAnd ``p ==> q ==> r``;

impImpAnd(andImp2Imp ``(p /\ q) ==> r``);

andImp2Imp(impImpAnd ``p ==> q ==> r``);
```

Exercise 7.3.3 Test cases

```
notExists ``~?z.Q z``;
```

3.2 Theorems and Theory Names

Use the following names:

Theory Name: `chapter8Theory`

Theorem Names: In all the exercises use the names below.

Exercise 8.4.1
`[problem1Thm]`
$\vdash p \Rightarrow (p \Rightarrow q) \Rightarrow (q \Rightarrow r) \Rightarrow r$

Exercise 8.4.2
`[conjSymThm]`
$\vdash p \wedge q \iff q \wedge p$

Exercise 8.4.3
`[conjSymThmAll]`
$\vdash \forall q\ p.\ p \wedge q \iff q \wedge p$

3.3 Submission Guidelines

Deadline: check course website

Content & format: zipped file of your Project 3 sub-directory containing a pdf of your report and all source files allowing complete reproduction of your report. **Your Project3 subdirectory will have the following structure and naming conventions:**

- You will have 3 subdirectories in Project3:

  ML: file *chapter7Answers.sml*, which contains all your source code answers for Exercises 7.3.1, 7.3.2, and 7.3.3

  HOL: which contains all your source code, e.g., HOL script files for Exercises 8.4.1, 8.4.2, and 8.4.3, and

  LaTeX: which contains all the files for your project report, e.g., style files, LaTeX files for your report, figures, etc.

- Proofs of all exercises will be in a *single* script file.

- Your **HOLReports** folder will be *subdirectory of your HOL folder*. Within HOLReports will be the following files:

  Holmakefile: which includes all the paths to theories needed, and specified in a way that does not require third parties to alter path information to compile pretty-printed reports.

  documentation.sml: which contains all commands necessary to pretty print your theory files

  Makefile: which is the script defining *make clean* and *make* commands that remove or build all pretty-printed HOL theory files, respectively.

How submitted: through course website

Other information: you will be allowed an unlimited number of attempts to submit your files up to the deadline. Your grade is based on the last submission.

3.4 Grading Criteria

Deliverable Item	**Problem Statement**	**Relevant Code**	**Session Transcripts**	**Code in Appendix**	**Total**
Chapter 1: Executive Summary	4 points for summary	N/A	N/A	N/A	4 points max
Chapter 2: 7.3.1	1	1	1	1	4 points max
Chapter 3: 7.3.2	1	1	1	1	4 points max
Chapter 4: 7.3.3	1	1	1	1	4 points max
Chapter 5: 8.4.1	1	1	1	1	4 points max
Chapter 6: 8.4.2	1	1	1	1	4 points max
Chapter 7: 8.4.3	1	1	1	1	4 points max
Appendix A *chapter7Answers.sml*	N/A	3	N/A	N/A	3 points max
Appendix B *chapter8Script.sml*	N/A	3	N/A	N/A	3 points max
Subtotal	10 points max	12 points max	6 points max	6 points max	34 points max
Folder with all necessary components to reproduce report and all ML and HOL results					34 points max
				TOTAL	68 points max
HOL Script Files and HOLReports Files					
Deliverable Item					**Total**
HOL theories build with *Holmake* error free					12 points max
Pretty-printed HOL theories in LaTeX compile using *make* error free					12 points max
				HOL Script and HOLReports Files Total	24 points max
				Grand Total	**92 points max**