COMP3601 Software Specification (2004/1)
Assignment (20%)

School of Information Technology and Electrical Engineering,[*]
The University of Queensland

Due 9am Tuesday 27rd April 2004

Adding a mechanism for managing loan durations to the library specification

Your library client wants new features added to the library and your job is to update the library specification to include these features. The client wants to classify books by their loan type (e.g. short-term, medium-term and long-term loans), provide durations for these types and to assign return dates when books are loaned.

The following variables are added to the state to support loan durations:

- *today* - a natural number representing the number of days from the library intialization to the current day.

- *loanTypeDuration* - a total function that associates a duration with each loan type (initially every loan type has a 0 duration).

- *bookLoanType* - a partial function that assocociates loan types with books (initially empty).

- *returnDayOfBook* - a partial function that associates each book on loan with its corresponding return day (initially empty).

The following constraints are to be added.

- Only library books have a loan type.

- All borrowed books have a loan type.

- No reserved book has a loan type.

- A book is on loan if and only if it has a return date.

You need to upgrade the **borrow_book** operation to calculate (and store) the return date of the book being borrowed.
You are also required to modify the **remove_book** and **add_to_reserve** operations to make them consistent with the new state and new invariant.
You do NOT need to consider any other operations from the original library specification.

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- Add/Change the loan type for a library book (**change_loan_type**).

- Change the duration associated with a loan type (**change_duration**).

- Start a new day – i.e. increment the date by one (**new_day**).

- Output the overdue books information (**overdue_books**). The overdue books information is the partial function from *BOOKID* to *READERID* that maps each overdue book to the corresponding borrower (where overdue means the return date is strictly before today).

Doing the assignment:

Download the tar'ed machine `ALibrary.tar.gz`.

Untar this in the directory where you keep your B machines.

Add your name and student number to the comment section at the beginning.

Edit this machine to produce your answer for the assignment. To aid in marking please do not move things around and add your new operations to the end and your new invariant predicates to the end of the invariant part.

Use the BTool to check the types and proof obligations.

When you are ready to submit your assignment you need to generate a postscript version. To do this do the following

```
cd TEX
dvips -o ALibrary.mch.ps ALibrary.mch.dvi
gv ALibrary.mch.ps       (to check if it looks OK)
```

NOTE: you need to generate the dvi file using Document Mark-Up in the BTool.

The postscript file you generated will be part of the submission.

See next page for submission details.

Submitting your assignment:

You must submit your completed assignment electronically through the website:
`http://submit.itee.uq.edu.au`
Please read
`http://submit.itee.uq.edu.au/student-guide.pdf`
for information on using electronic submission.

You may submit your assignment multiple times before the deadline - only the last submission will be marked.
A penalty of 20% per day will apply for late assignments.

You are required to submit 2 files:
`ALibrary.mch.ps`
`ALibrary.mch`

You MUST use these names for your files - the first one is the postscript you generated using the instructions given earlier. The second is the machine source.
NOTE: Make sure you get the `ALibrary.mch` in the CFG directory and NOT from the SRC directory. We will use this file in the BTool if we find problems with your postscript.

Marking Criteria (20 marks total)

The following marks allocated to modifications/additions should give you some clue about what needs to be done.

Invariant	4 marks
Initialisation	3 marks
borrow_book	3 marks
remove_book	1 marks
add_to_reserve	1 marks
change_loan_type	2 marks
change_duration	2 marks
new_day	1 marks
overdue_books	3 marks

Plagiarism and Collusion

The school policies on plagiarism and collusion apply and full details are available at
http://www.itee.uq.edu.au/about/student-misconduct.jsp.