Midterm 02 Exam Review Sheet

Logistics

Review Tips

In order to have a successful exam, the student should do the following:

- Review lecture slides and class notes [by Prof. Mohan] in google drive folder and the student’s class notes.
- Clear browser cache and get new slides before the exam. There might be some changes that will not show if you do not clear cache and download a new copy of the slides.
- Go through the reading assignments at the end of each slide, and read the textbook chapters. You can skip topics that were not discussed in class.
- Class activity exercises
- Lab assignments
- Quizzes

Exam Format

- Paper based
- Questions will be aimed at basic understanding of concepts and the ability to apply them in concrete examples.
- Question types will include:
  1. Short answer (may require writing programming statements, or analyze a given code, and writing descriptive answers through diagram illustration.)
  2. True/false
  3. Multiple choice
- You will not be asked to write whole programs; however, you have been exposed to a number of concepts through languages other than Java (in labs, in class) and you will be expected to recognize features of such languages when they were highlighted in class (e.g., implementation of OOP concepts in C++, CSharp, and Java, Functional programming concepts using LISP, and Script programming concepts using Bash).

Additional Details

- Exam is on: 11/20/2018 2:30 PM - 4:30 PM at Alden 101. The submissions after 4:30pm will be penalized for lateness (unless you have special arrangements). If you plan to be late to the exam starting time, you must let me know in advance.
• There would be three booklets given to you during the exam. The first is a question booklet, that contains the list of questions in the exam. The second is an answer booklet, where the students are expected to write their answers to the questions given in the exam. The third is an outline document, that provides an outline to the attributes of right answers. At the end of the exam, it is the responsiibility of the student, to combine all the three sections of the student’s exam using a paper clip provided and return back the exam to Prof. Mohan. After grading completion, the graded answer booklets would be returned back to the student.

• The exam will be closed [notes,lecture slides, textbook, other teaching materials, and NO internet].

• I highly recommend you use a black pen (preferrably Pilot G -2) for writing your answers during the exam. Please note, it is very difficult for me to read the pencil writing and hence there might be a chance for inaccuracy while grading.

• It is better to give part of an answer than to leave a question blank. No partial credit can be given for wrong answers if there is no accompanying work. If you leave a question blank, then there will be no points awarded to the question.

• Add necessary justification to your answer, if your understanding of the question deviate from the actual question. This rule also applies to multiple choice questions. I may give you partial credit or even full credit, based on how good you have justified your answer.

• I would strongly encourage you to make use of my office hours, to discuss and/or clarify any topic related to the exam.

**Topics covered**

The exam will cover all material up through Wednesday, 14th Nov, 2018. The main topics we have covered so far are:

• Data Types part 02 (chapter 7)

• Subroutines (chapter 08)

• Object oriented programming (chapter 09)

• Functional Programming [LISP] (chapter 10)

• Script Programming (Bash) (chapter 13)

• Script Programming (R Scripting)

**Exam Prep Guide**

Here are examples of the kinds of questions that might be asked. This is not intended to be a sample exam; the topics covered below are not intended to be an exhaustive review. In particular, knowing the answers to all the questions below will not guarantee a good grade on the exam!

1. In Fortran, arrays are stored in column-major order; in C and Java they are stored in row-major order. Does it make any difference to the programmer which method is used? Explain.
   Answer: It depends on the program. If the program tends to process data a column at a time, column-major is likely more efficient because of the principle of “locality of reference”—successive memory accesses will tend to be in the same block of memory, reducing the need for many memory accesses. Similarly, row-major order is better for accessing data a row at a time.

2. Given an array declaration, by using row major and column major ordering, identify the index of particular cell.
   [Formulaization]
3. How do you create a Dynamic Array in C? [use of malloc and pointers]

4. State some core properties of Object Oriented Programming? What is their common goal [Reusability]? Name two differences and two similarities between C++, Java and C#.

5. What are the final values of the variables boom and ghost in the following C code?

```c
double boom = 42.0;
double ghost = boom;
double *phantom = &ghost;
*phantom = 21.0;
```

**Answer:** Variable boom is unchanged—still 42. Variable ghost is equal to 21 since its address is in phantom.

6. Which of the following Java functions correctly finds the sum of the digits in a nonnegative integer named eeek? For instance, sum(354) = 3+5+4=12 and sum(10223) = 1+0+2+2+3 = 8.

(a) int sum(int eeek) {
    int r = eeek % 10;
    int q = eeek / 10;
    return r + sum(q);
}

(b) int sum(int eeek) {
    if (eeek == 1)
        return 1;
    else
        return 1 + sum(eeek/10);
}

(c) int sum(int eeek) {
    if (eeek < 10)
        return eeek;
    else
        return sum(eeek/10);
}

(d) int sum(int eeek) {
    if (eeek == 0)
        return 0;
    else
        return eeek % 10
        + sum(eeek/10);
}

**Answer:** The correct answer is (d). There is an infinite recursion in (a) (no base case tested); (b) is just wrong (makes no use of the digits); (c) returns only the last digit, not the sum of the digits.

7. Choose one of the following three languages (C, Haskell, Python) and mention two composite data types (as defined in our textbook) that are built into the language you chose.

**Answer:** C: arrays, records; Haskell: lists, tuples; Python: lists, sets.

8. Consider the following Lisp code:

```
(setq x 10) (setq y (if (= x 10) 3 5))
```

What value is assigned to y?

**Answer:** y is equal to 3 because it is an if statement, and it is saying that if the if statement true (x is equal to 10 - so it is true), set y to 3.

9. In Haskell, what is the value of the expression:

```
(take 1 ["bat","wolf","spider"]) ++ (drop 2 ["igor","vlad","boris"])
```

**Answer:** ["bat"] ++ ["boris"] = ["bat","boris"]

10. In Haskell interactive mode, what is printed by the following set of statements?

```
Prelude> let creature black lagoon = head black ++ (tail lagoon)
Prelude> let black = [[1,2,3],[4,5,6]]
Prelude> let lagoon = [7,8,9]
Prelude> creature black lagoon
```
Answer: Since head[black] = [1,2,3] and tail lagoon = [8,9], it will print [1,2,3,8,9].

11. Write a Haskell and Lisp definition for a function \texttt{isVowel} :: \texttt{Char} \rightarrow \texttt{Bool} which for a given argument \texttt{x} returns \texttt{True} if \texttt{x} is one of the vowels and returns \texttt{False} otherwise. This does not need to be completely bug free, but should be logically sound.

Answer:

\begin{verbatim}
(defun is-vowel(char) (if(find char '(a e i o u y)) 'true 'false))
\end{verbatim}

\texttt{isVowel} :: \texttt{Char} \rightarrow \texttt{Bool}

\texttt{isVowel} = ('elem' "aeiouAEIOU")

12. What is currying? Give an example.

13. Three things that students should know after attending Jonathan presentation in R scripting are:

- The R language is bested suited for performing data visualization and statistical analysis.

- If you want to preview a small amount of data in a dataset that you have read in, you can use the head() command.

- After reading in a dataset, you can create a simple scatterplot by using the plot() function and supplying the variables that should be plotted against the X and Y axes.

The above is not a full review! (For example, I will ask at least one or two question on Bash scripting.)