Final Exam

Held on 4/5th May, 2009 *4/5 May, 2009*

Name :
Course No : **CSCE150E**

Instructions:

1. There are two parts to this exam. The first part pertains to a program development of the game of Latrunculi. The final version is functional but not perfect. You are very welcome to have copies for your entertainment and further practice in programming! The second part is in a traditional exam format.

2. All answers should go on blank paper that will be provided. Very carefully number and draw lines separating each solution!

3. This is open book, open note, open computer, but not open neighbor. There should be lab space available.

4. If you have a question about the meaning of an exercise, ask! Getting things wrong because of misunderstandings can be aggravating for me as well as you.

5. This exam is offered on two days. You are on your honor not to reveal anything to members coming on Wednesday or accept anything from members coming on Tuesday.

The first set of exercises refer to the code of the Latrunculi program series. Complete at least half of the questions on each version of the program (ceil(n/2) where n is the number of questions). The files can be found at the cs150 folder on my Web site. There are a few questions that I am identifying as being extra challenging, for which some extra bonus credit will be provided if you choose to do them and do them well. They are not marked in any way.

1. (Latrunculi 1) What would a typical run of this version display on the screen?

2. (Latrunculi 1) What kind of a variable is *another*?

3. (Latrunculi 1) What is the effect of the doubled quotes and the 's' in the player input lines?

4. (Latrunculi 1) What is the significance of the curly braces instead of parentheses in the player input lines?

5. (Latrunculi 1) What is the significance of the 'i' in 'strcmpi' in the last function?

6. (Latrunculi 2) In the function 'setUpGame()' an array is assigned values from 'marker'. What array is this and why isn't it simply explitely assigned the letters 'b', 'w', 'B', or 'W'?

7. (Latrunculi 3) What is the effect of setting 'it = 3 - it'?

8. (Latrunculi 3) What do you suppose 'alive' is actually referring to? (What will trigger the program to end?)

9. (Latrunculi 3) There are a host of new functions that don't appear to be doing anything other than announcing their presence. What are they called and what purpose do they fulfill?

10. (Latrunculi 4) Explain the line 'play = upper(input(': ','s'))'.

11. (Latrunculi 5) What is 'validPlay' really checking for?

12. (Latrunculi 5) What is the difference between 'validPlay' and 'validMove'?

13. (Latrunculi 5) In 'validMove' there are really two tests. What constitutes a valid format? And then what determines if a play with a valid format is really a valid play?

14. (Latrunculi 6) The 'parse' function has a couple odd-looking subtractions in it. What is the effect of these subtractions?

15. (Latrunculi 6) What is 'ValidPiece' in the OpenGap function determining?

16. (Latrunculi 6) The 'startRow' and 'startCol' calculations are really weird. What is happening in them?

17. (Latrunculi 6) In plain English, what defines a valid open gap?

18. (Latrunculi 7) Why do you suppose the columns are lettered and the rows are numbered?

19. (Latrunculi 8) What is the difference between 'getPlay' and 'makePlay'?

20. (Latrunculi 8) The function 'makePlay' makes some very important assumptions about the play it is given to make. What are they?

21. (Latrunculi 9) The 'checkCapture' function is quite long, but naturally divides into three important independent sections (so it could have been split into three functions). What are they and what task do they perform?

22. (Latrunculi 9) There are a couple stub functions associated with 'checkCapture'. What are they and what will they eventually do?

23. (Latrunculi 9) The variables 'tranCol' and 'tranRow' have quite cryptic formulas involving 'abs' and the number 2, 13, and 9. They help cut down on the length of the function quite dramatically. What is the trick, the idea behind them?

24. (Latrunculi 9) What do the variables 'row', 'rowCnt', 'rowNum', and 'rowPos' mean and what values do they take on? (What is their relationship to each other?)

25. (Latrunculi 10) Why is there all the concern about 'upper' and 'lower' functions being applied in 'checkCorner'?

26. (Latrunculi 10) How does 'row + col' in the 'switch' of 'checkCorner' help shorten the logic? (Note the cases involving 3, 8 and 10, 12 and 14, and 19. What positions do they represent?)

27. (Latrunculi 10) What does the function 'zap' do? (What is the significance of 'marker(3)' and 'marker(4)'?)

28. (Latrunculi 11) What does 'checkSeq' really check for? (What is happening in the 'if' conditions?)

29. (Latrunculi 12) The 'setUpGame' function suddenly sees a change with the 'score' being set to 13 instead of 0. What do you suppose this means? (Note that revisions in earlier functions can be made while iterating through the development of a program. The programmer may miss a few things the first time around!)

30. (Latrunculi 12) The scores are updated in a seemingly strange formula in 'updateScore'. What is happening in the formula?

31. (Latrunculi 13) In function 'checkBlock', what is meant by the use of the term 'alive'? (What is the test for alive checking for in function 'movable'?

32. (Sudoku 14) In function 'declareWin', what determines a win or a tie?

This part of the exam may closely resemble the midterm and quizzes. If you have your old midterm and have studied from it, you may certainly use it and have no problem with this part of the exam. But note - there may be slight changes, so read carefully!

33. What is output by the following fragment of code? What is the time complexity as 'a' grows?

```
a = [1:5; 6:10; [1:5].^2];
for ii = a
    fprintf('%d %d %d\n', ii);
end
```

34. What is output by the following fragment of code? Would growth be linear or quadratic as 'ii' grows?

```
for ii = 1:5
   for jj = 1:ii
      fprintf('in ');
   end
   for jj = ii:5
      fprintf('out');
   end
   fprintf('\n');
end
```

35. What is output by the following fragment of code? Would growth be linear or quadratic as 't' grows?

```
t = 9;
for ii = 0:t
  for jj = 0:t
    fprintf('%4d ', mod(ii,jj));
  end
  fprintf('\n');
end
```

36. There are three types of files associated with Matlab. Mark as correct the following statements or reword (don't simply cross them off!) to make them correct.

   (a) .m files are used to hold the programs themselves. They can be created and edited using either the Matlab's edit window or any wordprocessor. These files may contain either script or functions.

   (b) Data files are used to hold the data generated by or to be used by a program. The commands in Matlab used to access these files are 'input' and 'fprintf'. Depending on the arguments, the resulting files may be human-readable or just readable by Matlab, comparable to shorthand for people.

   (c) Diary files are used to keep a comprehensive log of activity while Matlab is running. Once they are created, they can be used to automatically rerun a sequence of steps.

37. Data items in Matlab are held in the computer's memory which is organized as a linear series of cells. Answer the following questions about memory assuming a has been assigned the value $[15.5, 29.2, 51.7; 61.3, 22.1, 86.9]$ (careful! Note the semicolon.):

    (a) Assuming each piece of data in an array consumes one unit of memory (not really true), and the 15.5 is stored at location 3500, then where in memory would the 22.1 be stored?

    (b) Data are assigned into an array (as in $arr = [3, 5, 2; 5, 2, 3]$) in (column or row) major form and stored in memory in (column or row) major form.

    (c) Strings of characters (eg. $'howdy'$) could be stored either directly (as in $str =' howdy'$) or as an array (as in $str = ['h',' o',' w',' d',' y']$). True or false? Are these treated the same in Matlab?

    (d) Strings are often stored in cell arrays rather than regular arrays. Why?

38. Check all of the following that are true about short circuits, and correct those that are not true:

    (a) Short circuiting an AND expression means that the right hand side is not evaluated if the left hand side evaluates to false.

    (b) A short circuit occurs when lines from either side of a voltage source touch each other.

    (c) Short circuiting may not actually occur even if the short circuit operators are used.

    (d) Short circuiting an OR expression means that the right hand side is not evaluated if the left hand side evaluates to false.

    (e) Short circuiting in Matlab can only be done with scalar values.

39. Manipulating matrices is a forte of Matlab. How can one do the following using a single assignment statement?

    (a) Make an array consisting of the odd numbers from 1 through 1000.

    (b) Update only the last column of an array to all ones.

    (c) Update only the lowest rightmost corner cell to one.

    (d) Zero out all but the diagonal (starting at cell 1,1) of a square matrix.

    (e) Zero out all but the diagonal (starting at cell 1,end) of a square matrix.

    (f) Zero out only the diagonal (starting at cell 1,1) of a square matrix.

    (g) Triple the four corners of an arbitrary matrix.

    (h) Assign the (integer) quotient and remainder of a/b to a two-element array x.