CS1112 (CIS 1121) Fall 2008 Prelim 2 Oct 21 7:30–9:00pm

CIS1121 Final Exam

Q1: (10)	_________ ____
Q2: (20)	_________ ____
Q3: (20)	_________ ____
Q4: (25)	_________ ____
Q5: (25)	_________ ____
Total: (100)	_________ ____

Name: ____

(Legibly print last name, first name, middle name)

NetID: _________

Statement of integrity:

I did not, and will not, violate the rules of academic integrity on this exam.

_______________________________________ (Signature)

Circle your lecture time: 9:05 or 11:15

Circle your section number/instructor's name:

	Tuesday	***Wednesday***
10:10		Sucheta Soundarajan
11:15		Josef Broder
12:20	Sucheta Soundarajan	Josef Broder
1:25	Sucheta Soundarajan	Vivek Maharajh
2:30	Stefan Ragnarsson	Stefan Ragnarsson
3:35	Josef Broder	

Instructions:

- This is a 90-minute, closed-book exam; no calculators are allowed.
- The exam is worth a total of 100 points, so it's about one point per minute!
- Read each problem completely, including any provided code, before starting it.
- Raise your hand if you have any questions.
- Use the backs of pages or ask for additional sheets of paper as necessary.
- Clarity, conciseness, and good programming style count for credit.
- If you supply multiple answers, we will grade only *one*.
- Use only MATLAB code. No credit for code written in other programming languages.
- Assume there will be no input errors.
- Write user-defined functions only if asked to do so.
- Do not use `switch`, `try`, `catch`, or `break` statements.
- You may find the following MATLAB predefined functions useful:
  `sqrt`, `rem`, `floor`, `ceil`, `rand`, `zeros`, `length`, `fprintf`, `disp`, `plot`

Examples: `rem(5,2)` → 1, the remainder of 5 divided by 2
`rand(1)` → a random real value in interval (0,1)
`ceil`(8.1), `ceil`(9) → 9, rounds up to the nearest integer
`length([2 4 8])` → 3, length of a vector

Question 1: (10 points)

Part (a): (4 points)

What will be displayed at the end of each fragment below? If there is an error write the word "error" in the box.

```
w = [2 3];
x = w(w(1))
```

Output


```
z = [2 3 1];
for k = 1:length(z)
   z(k+1) = z(k);
end
disp(z)
```

Output

Part (b): (6 points)

What will be printed when the following script is executed?

Script	*Function*	*Output*

`a=2;  b=6;  c=3;`
`d= zoo(c,b);`
`fprintf('a is %d\n', a);`
`fprintf('b is %d\n', b);`
`fprintf('d is %d\n', d);`
	`function a = zoo(b,c)`
	`b= b/c;`
	`a= b;`
	`fprintf('c is %d\n', c);`	

Question 2: (20 points)

Complete each of the functions below according to the specifications. Do *not* use function `find`.

Part (a): (10 points)

```
function h = histData(yr, maj)
% h is the data for drawing a bar graph showing the number of UNDERGRADUATE
% students in each of the 90 majors at Cornell.
% yr and maj are vectors of the same length.  For a valid index k:
%   yr(k)  is the year code of student k.  Possible values are integers
%          in [1..13]; values 1,2,3,4 indicate undergraduate.
%   maj(k) is the major code of student k; possible values are integers
%          in [1..90].
% Assume that the length of yr (and maj) is greater than 1.

h= zeros(1,90);  % h(i) will be the number of undergrads in major i
```

```
bar(1:90, h)
title('Number of UNDERGRADUATE students in each major')
```

Part (b): (10 points)

```
function s = smoothVec(v)
% Smooth vector v by averaging each "interior" value with its left and right
% neighbors.  s is the smoothed vector and is two components shorter than v.
% Example:  If  v=[-2 5 3 4 8]  then  s=[2 4 5]
% Assume that the length of v is greater than 2.
```

Question 3: (20 points)

Complete each of the functions below according to the specifications. Do *not* use function `find`.

Part (a): (6 points)

```
function r = randInt(lo, hi)
% r is a uniformly random INTEGER in [lo..hi].
% lo and hi are integers.
```

Part (b): (14 points)

```
function ind = myFind(x, v)
% ind is the index of the first occurrence of value x in vector v.
% If x is not found in v then ind is 0.
% x is a scalar.  v is a vector with length greater than 1.
% For full credit your code should be efficient--stop as soon as x is found.
```

Question 4: (25 points)

Write the *function header* for the function below. The function name is **`checkLengths`**. It has two input parameters, **`a`** and **`b`**, and returns two vectors, **`shortV`** and **`longV`**.

```
% a and b are vectors with length>1; assume their lengths are different.
% shortV is the shorter vector between a and b
% longV is the longer vector between a and b

if length(a)<length(b)
    shortV= a;  longV= b;
else
    shortV= b;  longV= a;
end
```

Complete the function below to interleave two vectors. You must use function **`checkLengths`** from Part (a) above as part of your solution. *Do not use vectorized code!*

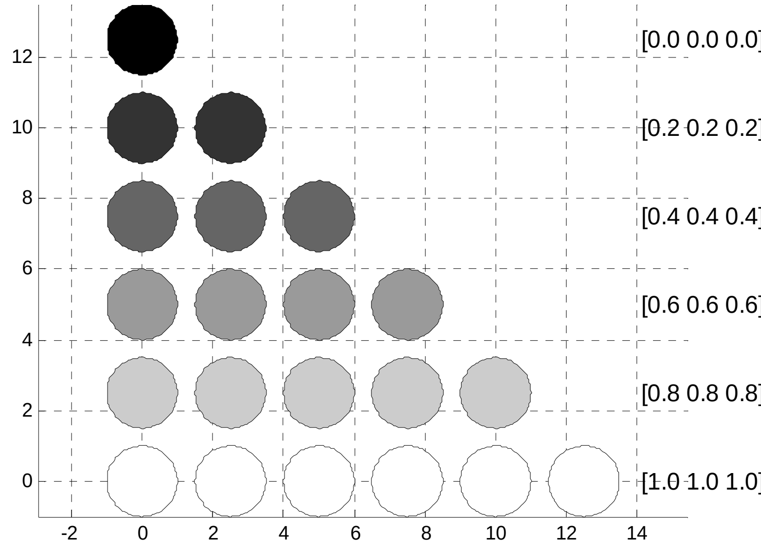
```
function v = interleave(a,b)
% Interleave the values from vectors a and b to form vector v.
% a and b are vectors with length > 1; assume their lengths are different.
% The first value in v comes from the longer vector of a and b.
% The "leftover" values from the longer vector are copied to the end of v.
% For example, if  a=[10 90 30]  and  b=[8 4 5 2 4]
%            then  v=[8 10 4 90 5 30 2 4]
% NO VECTORIZED CODE!
```

Question 5: (25 points)

Complete the function below to draw a set of grayscale disks arranged in a triangle. Read the specifications in the function comment. An *example* figure is shown on the right with **n**=6, **s**=0.5. Assume the availability of function **DrawDisk** and recall that you can specify a color in Matlab using a vector of length 3:

```
colr = [1 1 1]; %white
DrawDisk(5,0,1, colr )
```

draws a white disk with radius 1 centered at (5,0). The grid lines and "color values" are shown on the diagram on the right for your convenience; you do not have to draw them.



```
function grayness(n,s)
% Draw a triangle of disks; there are n disks on each side of the triangle.
% The disk in row 1 is black [0 0 0]; the disks in row n are white [1 1 1];
% the rows in between vary uniformly in grayness.
% The disks have unit radius and are spaced s units apart.
% The center of the lower left disk is at (0,0).

close all;  figure;  axis equal;  hold on
```

```
hold off
```