Practice Final

10 May 2013

You have up to 1 hour, 45 minutes. You may use a calculator, but no text book or notes.

1. For each statement below, fill in the blank with the *best* term from the following list. Some terms might be used more than once; some might not be used at all.

   • domain name • foreign key • frequency analysis • HTML • HTTP • IP address
   • kernel • minimax • operating system • password • primary key • public key
   • shell • table

   (a) The _____ is the core part of the operating system that includes the device drivers and other software modules for managing the device hardware.

   (b) A(n) _____ is an attribute in a database table whose value references a record in a different table.

   (c) _____ is a technique for trying to decrypt a message without requiring access to the shared secret. It's especially effective in a mono-alphabetic code.

   (d) A(n) _____ is a numeric identifier for each machine on the Internet. The current version is 32 bits.

2. Which of the following schemes is the more secure authentication mechanism?

   (a) A three-character password, using upper- and lower-case letters and digits.

   (b) A four-character password, using just lower-case letters.

   Explain why. Recall that we can quantify the security of a password using the number of *possible* passwords.

3. Explain how presenting a photo ID in the physical world is an example of *two-factor authentication.*

4. The three tables below are a simplification of the database for a social networking web site, like Facebook. There is one main table, 'User', and two other tables that contain foreign keys to 'User'.

User:

ID*	Name	Birthday	Password hash
1	Alice Ann	1974/08/18	cf6a52053ff904bca9d96fd4e7740d7d
2	Bob Björk	1989/11/07	75e22f4965738386cbe02bca10d3120d
3	Carl Carlson	1993/05/03	61aa5b6c78fa4e3636069347ae39df10
4	Dee Doe	1989/12/21	98246ef16a87c12407e5fada044f591e
5	Edward Eng	1990/11/19	1ca30cd59f0b566f9ef3a8208679585e
6	Francine Fuentes	1992/03/25	e5dbb7657f770fad038220f5c69d806c

Friendship — indicates which users are friends with which other users:

User 1 (ref. User)	User 2 (ref. User)	Status	Date
1	2	approved	2012/12/10
1	4	approved	2012/03/24
1	5	approved	2007/05/06
1	6	approved	2010/03/08
2	3	approved	2012/11/01
2	4	approved	2011/08/03
3	4	approved	2008/09/04
4	5	requested	2009/08/04

Wall Messages — sent between users:

Sender (ref. User)	Receiver (ref. User)	Date/time	Message
1	2	2012/12/05 11:51	"Hey man!"
1	5	2012/12/05 16:40	"What r u doing tonite?"
2	1	2012/12/05 17:45	"Send me some tunez"
2	3	2012/12/05 21:18	"Love that pic, LOL"
4	2	2012/12/05 23:00	"This prof is trying my patience."
3	1	2012/12/06 00:05	"Ugh, tired"
2	4	2012/12/06 06:37	"You rock!"

(a) Which user is the youngest? _____

(b) Which user has the most friends? _____

(c) The oldest friendship in the database is between which two users? _____ _____

(d) Name all the friends of Dee Doe.

(e) Are there any wall messages between users who are *not* friends? Which ones?

5. Below is a table of jobs that we must schedule on a batch operating system. All jobs are available from the start.

Job	Arrival time	Run time
J1	0	8 seconds
J2	0	3 seconds
J3	0	4 seconds
J4	0	5 seconds

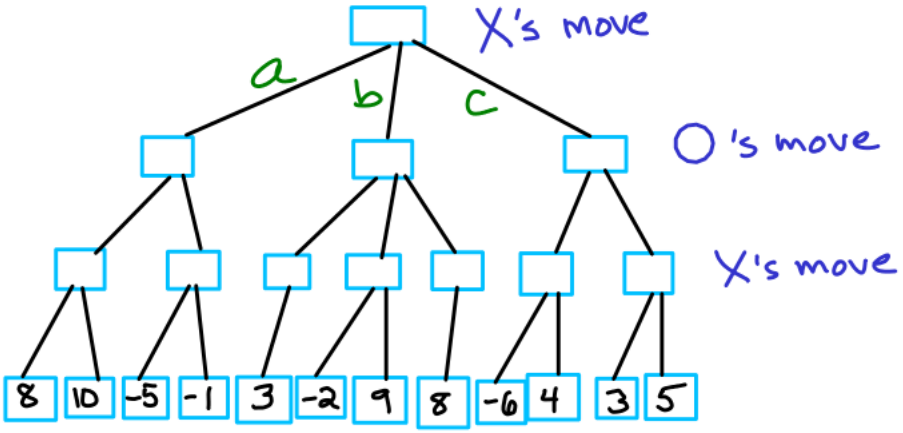
   (a) Create a time-line to illustrate the First-Come First-Served (FCFS) strategy. It should include the start/stop times of each job.

   (b) Compute the average **turnaround** time of the four jobs using your FCFS time-line from the previous question.

   (c) Create a time-line to illustrate the Shortest Job Next (SJN) strategy. It should include the start/stop times of each job.

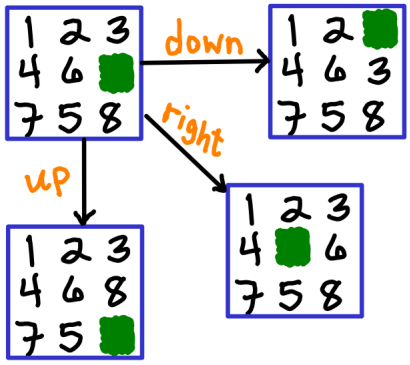
   (d) Compute the average **turnaround** time of the four jobs using your SJN time-line from the previous question.

6. Below is a game tree in which player X is deciding which move to make: a, b, or c. The scores across the bottom are the relative value of that game state for player X. Use the *minimax* algorithm to propagate the scores and **determine the best move** for player X.



7. This question is about planning by searching a state graph in AI. We will study the *8-puzzle,* in which the player slides eight tiles around on a 3×3 grid. The goal is to put the numbers in order, with the 'hole' in the lower right.

   Below is the start of a state space graph. The directions labeling the arrow transitions indicate that a numbered tile is moved *down* (or *up, left, right*) into the blank space. Complete the graph to show two more moves, and thus the path to the goal state: a solved puzzle.



8. In an attempt to conceal the character frequencies that are the downfall of a monoalphabetic substitution, the Vigenère technique (1553) switches the alphabet used on each letter, according to a secret keyword. We start with a table of shifted alphabets:

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
a	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
b	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a
c	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b
d	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c
e	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d
f	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e
g	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f
h	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g
i	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h
j	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i
k	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j
l	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k
m	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l
n	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m
o	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n
p	p	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
q	q	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p
r	r	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q
s	s	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r
t	t	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s
u	u	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t
v	v	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u
w	w	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v
x	x	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w
y	y	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x
z	z	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y

Below is a secret message encoded with the keyword 'blimp'. Work backwards to discover the message. The result should be two actual English words.

message:								
key:	b	l	i	m	p	b	l	i
encrypted:	h	l	u	q	d	w	p	z