

# Practice Final Exam

12 December 2012

You have up to 2 hours. 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) \_\_\_\_\_ is the way that web browsers and servers communicate with each other.
- (b) Cryptography based on a(n) \_\_\_\_\_ was a breakthrough because it meant we no longer need to establish a *shared secret* with our comrades.
- (c) A(n) \_\_\_\_\_ is an attribute that uniquely identifies each row in a database table.
- (d) A(n) \_\_\_\_\_ is responsible for providing an interface between the computing hardware and multiple software applications.

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

- (a) A four-digit number, like a bank PIN.
- (b) A three-character password, using only lowercase letters.

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

3. 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!"

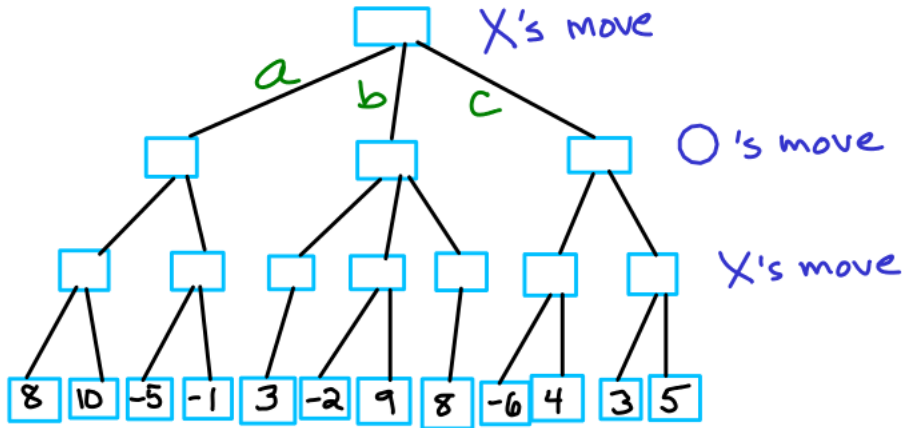
- (a) Which user is the youngest? \_\_\_\_\_
- (b) Which user has the most friends? \_\_\_\_\_
- (c) The oldest friendship in the database is between which two users? \_\_\_\_\_
- (d) Name all the friends of Dee Doe.
- (e) Are there any wall messages between users who are *not* friends? Which ones?

4. Below is a table of jobs that we must schedule on a batch operating system. **Note the arrival times — a job cannot be scheduled before it has arrived!**

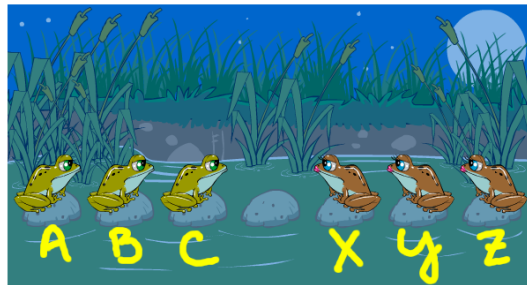
<u>Job</u>	<u>Arrival time</u>	<u>Run time</u>
J1	0	5 seconds
J2	0	4 seconds
J3	3	2 seconds
J4	5	4 seconds

- (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.

5. 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.



6. Six frogs are trying to cross a pond by jumping between stones. Alma, Ben, and Carl are heading East; while Xavier, Yolanda, and Zanjoe are heading West. Each frog can jump just onto an adjacent stone, or jump *over* another frog if there is an empty stone behind it. The frogs are stubborn, however, and are **not** willing to change direction.



Design a simple representation for the state of the world, and draw a graph showing all possible moves **three** steps out from the start state, as illustrated.

7. 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 'face'. Work backwards to discover the message. The result should be two actual English words.

message:									
key:	f	a	c	e	f	a	c	e	f
encrypted:	j	n	l	s	d	b	t	i	k