Name: _____Sid_____     Student ID Number: _____

Signature: _____

# EECE 418 2008 Midterm Exam

Department of Electrical and Computer Engineering

University of British Columbia

Dr. S. Fels

*(handwritten: 1398 worst 7th)*

*(handwritten: 10-15 min)*

*(handwritten: 4:30)*

**Exam Instructions (read carefully):**

1. Sign the first page of the exam with your **signature** in the space provided on the upper left **immediately**.

2. Continue reading the instructions, but **do not open the exam booklet** until you are told to do so by a proctor.

3. Print your **Name** and **Student Identification Number** on every page in the space provided at the top of each page **before you start the exam.**

4. Cheating is an academic offense. Your signature on the exam indicates that you **understand** and **agree to** the University's policies regarding cheating on exams.

5. Write **all** of your answers on these pages. If you need more space, there is blank space at the end of the exam. Be sure to indicate when a question is continued, **both** on the page for that question and on the continuation page.

6. The exam is **closed book**. There are **no aids permitted**, except for a calculator.

7. You have **60 minutes** in which to work. **Budget your time wisely**.

8. No one will be permitted to leave the exam room during the **last ten minutes** of the exam.

| Section | Points | Received |
|---------|--------|----------|
| 1 | 20 | |
| 2 | 16 | |
| 3 | 44 | |
| 4 | 16 | |
| 5 | 20 | |
| Total | 116 | |

*(handwritten: Answer Key.)*

**Section #1: Design Process [20 points]**

1) What are 4 fundamental components of creating a problem definition [8 points]:

a) situation of concern

b) form of solution

c) level of support

d) users

2) Describe how to run a Brainstorming session. Be sure to include the main rules for Brainstorming [12 points].

2~5 people

assign facilitator

assign note taker

list topic(s)

get all ideas as they come
— no criticism

when popcorn stops, move to next topic

**Section #2 Prototyping[16 points]:**

3) Pretend you are designing a new digital music player. You have a list of specific questions about the usability of your design. **For each** of the following questions, i) indicate what level of fidelity of prototype is appropriate and ii) describe a prototype you could build to answer that question reliably but with minimum effort/overhead [16 pts total]:

a) Can users figure out how to turn on the power?

*low fidelity*

*block of wood with drawn switch.*

b) Do users know where to find items within a certain feature's menu structure such as items to work with text messaging?

*low to medium.*

*low — paper proto with stickies / transparency*

c) Which font do users find the most readable for default GUI text?

*low-fi*

*Set of print outs of different fonts. On same form factor size*

d) Can users figure out how to take pictures with the onboard camera and send them to a friend?

*high fidelity*

*vertical prototype with menus that only support photo taking.*

**Section #3 Pre-user studies and goal for the UI specifications [44 points]:**

4) Often, designers are forced to use non-user-based methods because of time & money limitations. Describe **2 other situations** when it might make sense to use non-user-based methods [4 pts total]:

~ i/f is well known - small change

— users don't exist yet (new tech)

— other reasonable reasons

5) Pretend you are using the Cognitive Walkthrough (CW) technique to examine a computer Operating System. You are examining the "log in" step: The display presents a mostly-blank screen with the logo of the OS (Figure 1). At this point, if the user presses Ctrl-Tab, the system loads for 3 seconds and then presents a password entry dialog. If the user presses Ctrl-Backspace the system will immediately power down (see Figure 2).
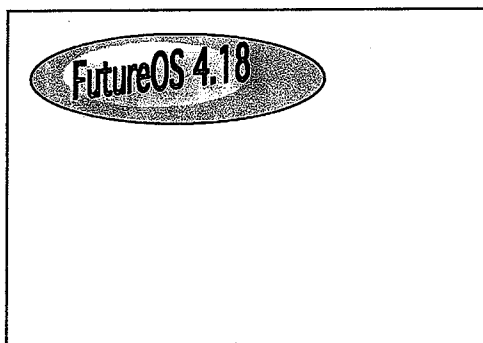
FutureOS 4.18

**Figure 0: Log-In Screen**

Login Screen → Ctrl-Backspace Pressed → PC Shuts Down
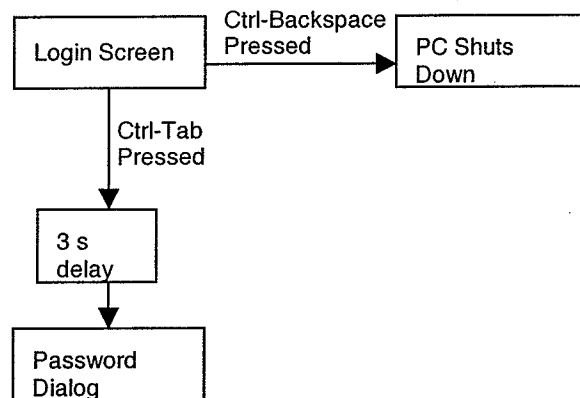
Ctrl-Tab Pressed

3 s delay

Password Dialog

**Figure 2: Flow Chart for Log-In Process**

Go through the 4 steps of a Cognitive Walkthrough for this part of the system. **Describe your observations** at each step and **list each problem** that you find [16 pts total].

1. Is correct action visible?

   No - can't see what keys to press
         to either login or shut down

2. will user recognize correct action

   - if they do press right key, it will take long time
     to see if they did correct action
   - if they "power-down" done may not know what
                                              did it

3. will user interpret result correctly

4. will they be able to progress towards goal.
   - probably not unless they press correct key

6) **Heuristic evaluation** has two main deliverables to the design team. Please list them below [4 pts]

— overall list of problems + heuristics used

— severity store + frequency

— possibly soln' ideas                    36-47

7) What 2 characteristics should a heuristic evaluator have? [4 pts]

—not be on team

— expert                                  36-40

**8) Keystroke-Level Analysis:** [16 marks]

You have to print out many numbered plots that you have created using a command line interface. The usual way to do this is:

```
printplot <4 digit number> <3 digit number> <return>
```

where the first number is the plot number and the second number is the version number and <return> is the return key. The system takes about 5 seconds to process the command and you have to think about which plot number and version that will be printed as you have quite a few of them.

However, you decide to create an alias for the command using:

M  5K  m/c m   11K   [m]  K

```
alias p 'printplot' <return>
```

so that you can shorten the command to:

```
p <4 digit number> <3 digit number> <return>
```

Using keystroke level analysis, and the table of typical values provided at the end of this exam paper, how much time does this save if you have to plot 100 graphs? **Show your work and state any assumptions.**

For 1st approach

1)

$M = 1.35$
$K = 0.30$

m
9K
m
4K
m
3K
K
―――
$(3m + 16K)100$

or $(4m + 16K)100$

2) with alias.

m
5K
m
K
m
11K
1K
―――
$3m + 18K$

alias

cmd

m
K
m
4K
m
3K
K
―――
$3m + 9K$

$(3m + 18K) + 100(3m + 9K)$

$(4m + 18K) + 100(4m + 9K)$

1st Approach

2nd

i) $(3(1.35) + 16(0.3))100 =$

$(4.05 + 4.8)100 = 885 sec.$

$3.35$ $3(1.35) + 18(0.3) +$

$100(3(1.35) + 9(0.3))$

$= 9.45 + 675 = 684.45$

ii) $[4(1.35) + 16(0.3)]100 = 1020 sec$

ii $4(1.35) + 18(0.3) + 100(4(1.35) + 9(0.3))$

$= 10.8 + 810$

$= 820.8 sec$

— watch for missing M's.

— not adding right

— inconsistent use of M without justification

## Section #4: User-Centred Design Methods [16 points]

9) Contextual design is a structured process for design of technology within the context of the environment of use, usually a workplace. Phase 1 is called contextual inquiry, in this phase the designer tries to understand the context of use of the proposed design. In this phase, what role does the designer play in relation to the user? [4 pts]

— observer or partner or interviewer
(2)              (4)              (4)

10) Which one of the following methods **must** be used in contextual inquiry? [2 pts]

a) Passive observation
b) Video recording
c) Heuristic analysis
d) Interviewing
e) Cognitive walkthrough
f) User testing

46 - 14+

1. contextual inquiry

11) What happens in Stage 2 of contextual design (name and brief description)? [2 pts]

Transcribing/organizing data     Work modeling; find objects of work activities

12) What is its goal? [2pts]

modeling     find specific insights, encapsulate and document understanding

13) What happens in Stage 3 of contextual design (name and brief description)? [2 pts]

find insights, categorizing data     work consolidation — abstract specific ideas/insights

14) What is its goal? [2 pts]

find relationships between idea/concepts

15) What is an affinity diagram? [2 pts]

a method to find relationships between ideas using spatial reasoning.

**Section #5: Mental Models [20 points]**

16) In Norman's seven-stage model which steps are responsible for the gulf-of-evaluation (circle all that apply [4pts]:

A. establishing goals

(B.) evaluation of interpretation

C. sequence of actions

(D.) perceiving the state of the world

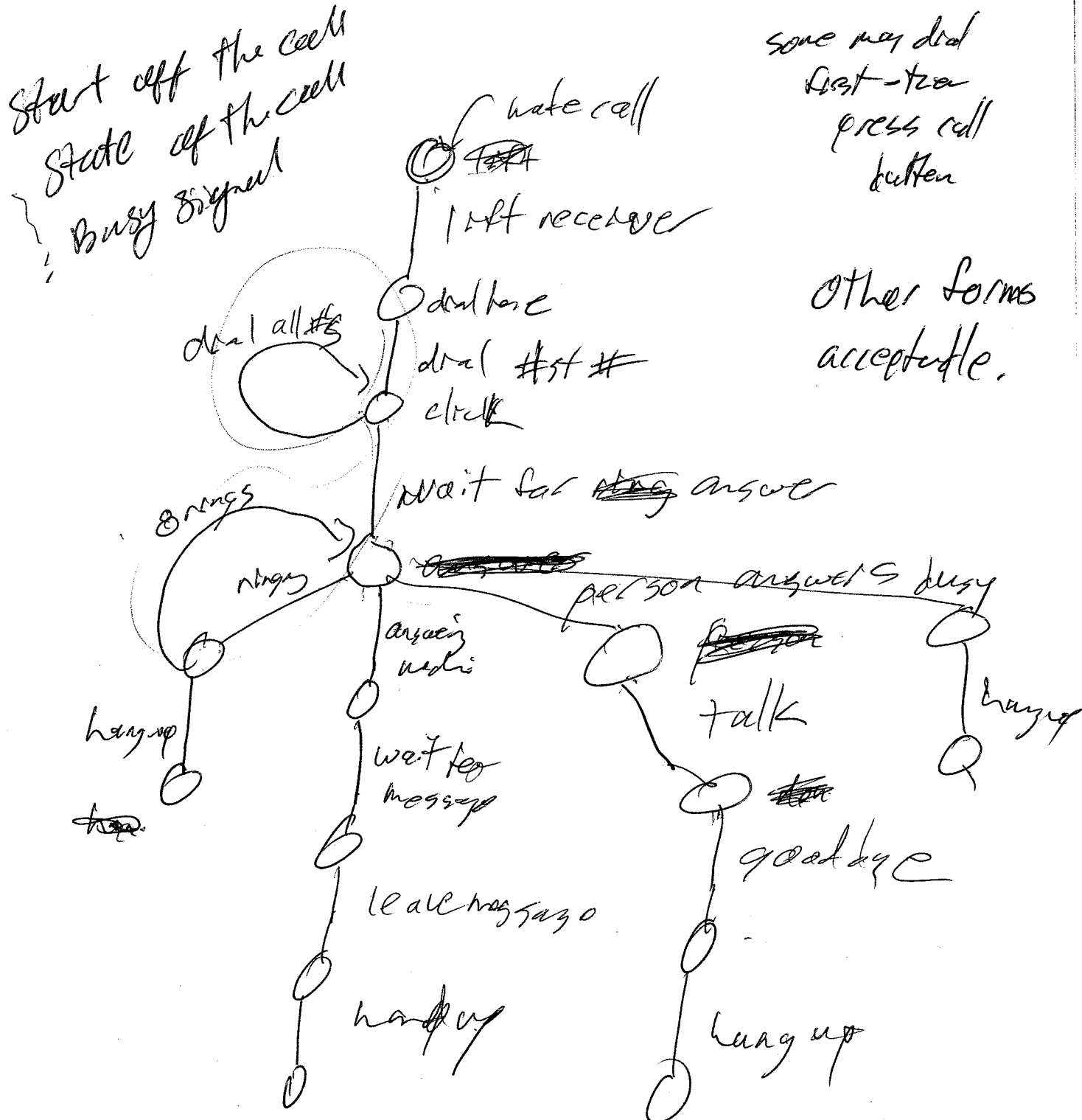E. execution of the action sequence

F. intention to act

(G.) interpreting the perception

18) What does the gulf-of-execution mean [4pts]?

*have goal but don't know how to formulate either metalanguage of action, sequence of actions, or the execution of action itself.*

19) Draw a mental model of a simple telephone call using a typical cell phone (State any assumptions you make) [12pts].

Start off the cell
State of the cell
, busy signal

make call

left receiver

dial all #

dial tone

dial #s+ #

click

some may dial
first-then
press call
button

Other forms
acceptable.

wait for answer

rings

rings

person answers busy

answering
machine

talk

hang up

wait for
message

goodbye

hang up

leave message

hang up

hang up

| Operator | Description | Time [sec] |
|---|---|---|
| K | Key press or button | 0.30 |
| P | Point with Mouse (depends upon Fitts law) | 1.10 (average) |
| H | Homing time | 0.40 |
| D(nd,ld) | Straight line drawing time | $0.9nd + 0.16ld$ |
| M | Mentally prepare | 1.35 |
| R(t) | Response time (system) | |

Table 1: Performance times for Keystroke Level Analysis from Card et al (1983)

Name: _____  Student ID Number: _____

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