Name: _____ **Student ID Number:** _____

Signature: _____

CPSC 444 2001-2001 (T1) Midterm Exam
Solutions

Department of Computer Science
University of British Columbia
K. MacLean

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. Please read the **entire** exam before answering any of the questions.
6. There are 5 questions on this exam, each worth the indicated number of points. **Answer as many questions as you can**.
7. 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.
8. Interpret the exam questions as written. **No questions** will be answered by the proctor(s) during the exam period.
9. The exam is **closed book**. There are **no aids permitted**, except for a calculator.
10. You have **50 minutes** in which to work. **Budget your time wisely**.
11. No one will be permitted to leave the exam room during the **last ten minutes** of the exam.

Question	Points	*Class Mean*
1	**18**	***15.8***
2	**28**	***24.5***
3	**24**	***15.1***
4	**18**	***11.4***
5	**12**	***9.3***
Total	**100**	***76.1***

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Question #1 [18 points total]: Usability Metrics

You've been assigned by your employer (a user interface consulting firm) to help another firm evaluate their in-house calendaring system prior to a re-design. Incommunicado Inc., your client, is a management-consulting firm employing about 100 individuals - most of who spend much of their time off-site with their own clients. This calendar was custom-designed for Incommunicado two years ago, and employees, who are required to use it, have been complaining about it ever since. Because of the amount of time employees spend away from the office, and the need for employees to confer about their clients when they're back home, the calendar plays a central role in the company and it's imperative that it work well. Therefore Incommunicado's VP of Administration would like to make sure that the problems are clearly understood and quantified before commissioning a new system.

The primary purpose of the company calendar is to publicize time and location of scheduled meetings and seminars, as well as planned individual absences due to business trips, vacation, etc. It relies on web access (to which all employees have ready access, both when on-site and traveling) both to make entries and to view. Typically, users submit an entry to the calendar when they have scheduled a meeting involving several other employees, or when they know they will be out of the office for more than a few hours. By looking at the calendar *before* scheduling a meeting, they theoretically can avoid conflicts with other meetings, or absences of key attendees.

You've decided that as a first step, you should look at the existing calendaring system and evaluate it in terms of relevant quantitative usability metrics. **Below, list up to 6 additional usability metrics that are likely to provide useful data for this situation.** One is already listed as an example. **For each metric, make sure you identify exactly what is to be measured.** [3 pts per metric]

0. **Time required** to create a new entry in the shared calendar

1. **…**

Variants on the following responses were accepted. Points were subtracted if metric was not related to this system, or if a non-quantifiable metric was used (i.e. there is no obvious way to measure it).

- ***Time required*** *to modify or delete an entry in the calendar, view a specific time or day in the calendar, etc*
- ***Number of individuals*** *required to make an entry in the calendar (e.g. does a secretary or someone with special privileges have to authorize the entry?)*
- ***Frequency with which erroneous input is accidentally supplied*** *to the system*
- *User's ability to* ***recover from erroneous input***
- *Time required for a user to* ***learn to use*** *any aspect of the system (e.g. entry input or viewing a specific part of the calendar)*
- *User's* ***retention of learning of system use***
- *User's ability to* ***customize the system*** *for their own situation*
- *The ease with which* ***users can reorganize their scheduling activities*** *– e.g. change their methods of scheduling meetings, view extra commitments, etc.*
- *User's* ***satisfaction*** *with the system.*

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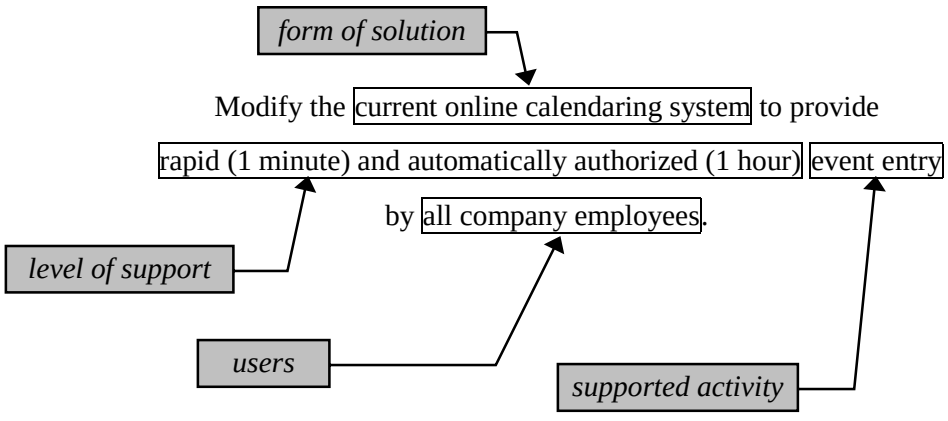
Question #2 [28 points total]: Problem Definition

Your next step in the evaluation of Incommunicado Inc.'s offending calendar system is to create a problem statement. After conducting some quantitative tests on the system and talking to a few employees, you have tentatively defined a situation of concern that includes the following problems with the existing calendaring system, among others:

- Too many steps are required to make a new entry in the calendar. These include accessing the web form, choosing a day, time and duration, choosing the list of participants from a pull-down list of employees, choosing a location, submitting the request, authorizing the request, and refreshing the database. The initial entry process takes about five minutes for a group of 5 attendees (not including the authorization delay). Users interviewed feel the process should take only one minute for an attendee list of any length.
- Before the entry appears in the public calendar, it must be authorized by one of two secretaries with the proper system privilege. The authorization requirement frequently imparts a delay between an entry request and actual appearance of up to an entire day, and in the meantime individual schedules may change. Users interviewed feel a delay guaranteed to be within one hour would be acceptable.

Create a **one-line problem statement** that, if executed, will resolve this situation of concern. In this statement, **identify each of the four fundamental components** of the problem definition **by circling and labeling them.** [7 pts per correctly mentioned and identified component]

Variants of the following were accepted: 3 pts per fundamental component mentioned and correctly identified (12 pts total), and 4 pts per fundamental component included in the problem statement (16 pts total). Points also subtracted if level of support was not quantified (-2 pts); the statement was not a sentence; if components did not make sense with respect to each other; or if whole statement generally didn't make sense or say anything helpful.



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Question #3 [24 points total]: Human Performance

(a) **List the three types of memory** discussed in class and readings, **in the order in which sensed information travels through them**. For each, describe the three attributes in terms of the specified relative adjectives [14 pts]:

Memory type	**Rate of access** (rapid, slow)	**Rate of decay** (rapid, slow, never)	**Capacity** (small, large, infinite)
Sensory, or iconic / echoic / haptic	*rapid*	*rapid*	*large*
Working or short-term	*rapid*	*rapid*	*small*
Long-term	*slow*	*never*	*large or infinite*

Points allocation for (a), total of 14:

- *Types named correctly (1 pt / type = 3 pts)*
- *Types listed in correct order (2 pts)*
- *Correct attributes (1 pt each, = 9 pts)*

(b) The 7 ± 2 rule [4 pts]:

Briefly describe it (1 sentence):

We can remember 7 ± 2 chunks of information; therefore chunking information can increase the short-term memory capacity [2 pts]

To which type of memory does it apply? *working [2 pts]*

(c) State how information moves from memory module to the next [6 pts]:

Sensory to working memory: *attention [3 pts]*

Working to long-term memory: *rehearsal [3 pts]*

The words listed in the box are the ones given in class and in readings. For Working to Long-Term Memory, partial credit (2/3) was given for near-synonyms such as "practice" or "repetition".

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Question #4 [18 points total]: Empirical Laws

You have been given the task of designing the menu system of a powerful CAD application. There are a total of N_{tot} = 100 specialized tools which must be distributed into a set of menus; it will be up to you to decide how many menus there should be.

As a first cut, you have decided to estimate the optimal number of menus (and items per menu) based sheerly on speed of access by applying empirical laws to the problem. (Of course, there will be other criteria as well, such as logical / semantic groupings of functions; but first you want to know *approximately* how many items you should try to group together).

You know from cpsc444 that Hick's law is the empirical rule that you need to apply in this case; looking it up in your old textbook, you recall that it is defined as $decision\ time = T_{Dec} = K\log(N+1)$.

You thus need to determine the values of *m* and *n* which, based on Hick's Law, should result in the lowest total decision time, where

m = number of menus

n = avg. number of items per menu

N_{tot} = $m \times n$ = total # of menu items

(a) For this exercise, **compute the total relative decision time (T_{DecTot} / K)** resulting from the values of *m* listed in the table below. **Show your work.** [15 pts]

*You may use either a calculator or use the table of logarithms **at the end of the exam**; please state which method was used.*

Method (check one): calculator _____ table of logarithms _____

Answers are listed for both base-10 and (natural) logarithms, which produce the same relative trend. Allocation: correct values of "n" (3 pts), recognizing equation must be applied 2x (6 pts), correctly deriving equation (3 pts), and correctly computing values given equations you've derived (3 pts).

m	***n***	**Total Decision Time / *K***
1	*100*	*Log(2)+log(101) = 2.30 (5.30)*
5	*20*	*Log (6)+log(21)= 2.10 (4.84)*
10	*10*	*Log(11)+log(11)= 2.08 (4.80)*

(b) Based on the results above, **state your guess for the optimal values for *m* and *n***, as well as a **brief (1-2 sentence) justification**. [3 pts]

m=n=10 delivers the best value of the cases tried here, and this also makes intuitive sense; however, the curve is flattening out by then and there's little difference between 5/20 and 10/10. (You could verify this estimate either by computing another neighboring value or two (e.g. 9x11); or by actually optimizing the base equation, $T_{DecTot} = K\{\log(n+1)+\log(m+1)\}$, by taking its derivative and setting it to zero).

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Question #5 [12 points total]: Requirements Definition

Okay, back to Incommunicado Inc. You've gotten a general idea of the problems with the current design, and you've been asked to generate a requirements definition document for a re-design of Incommunicado's in-house calendaring system.

You've realized that this is clearly a complicated case: a lot of different people with different roles in the company use the system – and of course by now, you've talked with representatives of each group and received their individual perspectives.

Below, **list three key stakeholders** (groups or individuals) who will need to be involved in the redesign process. [12 pts]

Note that there is not a single correct response to this question. Use your common sense.

Stakeholder 1: _____

Stakeholder 2: _____

Stakeholder 3: _____

Credit was given for all reasonable answers: 4 pts / stakeholder (12 pts total). Examples of possible answers are listed below. Points were subtracted for answers that were unhelpfully vague (e.g. "employees": there are many possible roles an employee can take, and therefore different stakes. A VP, consultant and a secretary are all employees.)

*On the **clients** side, there could be:*

- *Consultation team members (primary users) – traveling and non-traveling*
- *VP of Administration, who apparently is responsible for having a good calendaring system*
- *Financial officers, who will determine whether the company can afford it*
- *IT staff in charge of maintaining the system*
- *Administrative staff in charge of scheduling meeting rooms*

*On the **developers** side, there could be:*

- *Designers (whoever is eventually given the job of actually defining the new system)*
- *Programmers (whoever is eventually given the job of building the new system)*
- *Management of your own company (interface design consultancy) who also needs to make a profit on the whole business*

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Table of natural logarithms

n	log (n)
1	0.000
2	0.301
3	0.477
4	0.602
5	0.699
6	0.778
7	0.845
8	0.903
9	0.954
10	1.000
11	1.041
12	1.079
13	1.114
14	1.146
15	1.176
16	1.204
17	1.230
18	1.255
19	1.279
20	1.301
21	1.322
22	1.342
23	1.362
24	1.380
25	1.398
30	1.477
40	1.602
50	1.699
60	1.778
70	1. 845
80	1.903
90	1. 954
100	2.000