University of Torotno
Department of Computer Science
DECEMBER EXAMINATIONS, 1996

CSC 104F Final Exam

Duration — 3 hours

No Examination Aids Allowed

Instructors:	**M. Craig**	(TAs: P. Sliz, C. Jansen, T. Guidmond, C. Wilson)
	G. Kissin	(TAs: A. Hunter, T. Panayiotis, M. Fiorucci, B. Hall)

Name: ______________________ Instructor: ______________________
(Circle your surname)

Student #: ______________________ TA: ______________________

- No dictionaries are permitted. If you do not understand the meaning of a word or question, put up your hand and someone will help you.
- No calculators, electronic devices, or cell phones are allowed.
- *Hand in this completed examination book.*
- This examination book has 26 pages, including this one.
- This examination is worth 40% of your final grade.

All students must answer all questions from Sections A through D.

Day section students (M.Craig's Class) must also answer section E.

Evening section students (G. Kissin's Class) must also answer section F.

A. ________	/ 40	D. ________	/ 7
B. ________	/ 20	E or F. ________	/ 25
C. ________	/ 8		

TOTAL ________ / 100

CONTINUED

A. Multiple choice questions — 40 marks (one per question)

Circle the one correct answer per question.

1. Based on Von Neumann's papers, a computer can be defined as a device that accepts input, processes the input, stores the results of processing, and:
   (a) sorts the processing.
   (b) provides output.
   (c) establishes conclusions.
   (d) responds to the input.

2. __________________________ refers to the physical components of a computer system such as the system unit, hard disk drive, keyboard and monitor.
   (a) Software
   (b) Hardware
   (c) Computer program
   (d) CPU

3. A(n) __________________________ is a set of instructions that tells a computer how to perform a particular task.
   (a) computer program
   (b) output device
   (c) control unit
   (d) input device

4. Which one of the following statements is **FALSE** about peripheral devices?
   (a) Peripheral devices are usually built into the main board of the computer.
   (b) Peripheral devices usually require specially designed software to instruct the computer how to use them.
   (c) Peripheral devices allow you to expand and modify your basic computer system.
   (d) Some common examples of peripheral devices are scanners, sound cards, projectors, and modems.

5. Which one of the following statements is **TRUE** about command-line user interfaces?
   (a) There is a standard command-line user interface used by all computers.
   (b) Command words, parameters and punctuation are used to create commands that tell the computer what you want it to do.
   (c) With command-line user interfaces, the computer initiates the dialog by asking you a question.
   (d) There is no need to memorize command words or syntax to effectively use command-line user interfaces.

6. Which one of the following statements is **FALSE** about graphical user interfaces?
   (a) Graphical user interfaces are often based on a metaphor in which computer components are represented by objects.
   (b) Most graphical user interfaces do not support a mouse.
   (c) Graphical user interfaces are based on the philosophy that people can use computers intuitively.
   (d) Graphical user interfaces allow people to manipulate on-screen objects that represent tasks or commands.
   (e) The Macintosh operating system uses a graphical user interface.

7. After you purchase computer software, you generally do NOT have the right to:
   (a) install the software on your hard disk drive
   (b) make a backup copy of the software
   (c) sell or give away copies of the software
   (d) modify the software

8. ______________________________ is software that is not under copyright protection. It can be freely copied, distributed, and even resold.
   (a) Shareware
   (b) Public domain software
   (c) Copyrighted software
   (d) Multimedia software

9. System software includes all of the following EXCEPT:
   (a) device drivers
   (b) productivity software
   (c) utility software
   (d) operating systems

10. The operating system usually handles all of the following EXCEPT:
    (a) allocating resources for multiple programs and/or users
    (b) managing storage space
    (c) detecting equipment failure
    (d) creating charts and graphs

11. ______________________ allows the user to run two or more programs at the same time.
    (a) Threading
    (b) Multiuser
    (c) Multitasking
    (d) none of the above

12. Multiuser operating systems are typically found on either:
    (a) PCs or minicomputers.
    (b) mainframes.
    (c) minicomputers.
    (d) mainframes or minicomputers.

13. A ______________________ allows a software developer to write programs using English-like instructions.
    (a) software productivity tool
    (b) word processing software
    (c) business application
    (d) programming language

14. Which type of productivity software would you use to enter formulas, perform what-if analyses, and produce charts?

    (a) spreadsheet
    (b) accounting
    (c) database
    (d) word processing

15. To find information from a database, you enter a ________________________ that tells the computer exactly what you want to find.

    (a) query
    (b) report
    (c) prompt
    (d) none of the above

16. Merging new technologies like video tapes, audio tracks, CDs, and photos with a computer has led to ________________________ computing.

    (a) parallel
    (b) multimedia
    (c) multiuser
    (d) concurrent

17. The feature which "links" documents to each other making it possible for a reader to jump from one passage in one document to a related passage in another document is called ________________________ .

    (a) multimedia
    (b) referencing
    (c) hypertext
    (d) educational simulations

18. How many different messages can you send with two lanterns, given that a lantern can be either on or off?
    (a) two
    (b) four
    (c) six
    (d) eight

19. Digital computers represent numeric data using the:
    (a) AXCDIC coding system.
    (b) EBCDIC coding system.
    (c) binary number system.
    (d) decimal number system.
    (e) ASCII coding system.

20. A data bus contains:
    (a) address lines and interface lines
    (b) data lines and serial lines
    (c) address lines and data lines
    (d) parallel lines and data lines

21. Which one of the following statements is **FALSE** about RAM?
    (a) RAM does not require power to retain its contents.
    (b) RAM is composed of thousands of circuits that each hold one bit of data.
    (c) Each bank of eight RAM circuits has an address so the computer can locate the data each bank contains.
    (d) Data stored in RAM can be erased and new data stored in the same RAM locations.

22. Hard disk space used as an extension of RAM is called:
    (a) main memory.
    (b) extended memory.
    (c) virtual memory.
    (d) expanded memory.

CONTINUED

23. The CPU consists of all of the following EXCEPT the:
    (a) control unit
    (b) ALU
    (c) instruction register
    (d) ROM

24. When we say a computer has a 16-bit microprocessor, we are referring to the:
    (a) clock rate.
    (b) disk cache.
    (c) word size.
    (d) instruction set.

25. What type of memory "anticipates" what data you are likely to need for your next task?
    (a) RAM
    (b) cache
    (c) ROM
    (d) dynamic

26. Which one of the following does NOT affect microprocessor performance?
    (a) clock speed
    (b) word size
    (c) data bus size
    (d) hard disk size

27. Music synthesizers and musical instruments can be connected to your computer system using the ____________________ port.
    (a) serial
    (b) parallel
    (c) SCSI
    (d) MIDI

28. What is the first stage of the boot process?
    (a) loading the operating system
    (b) doing a power-on self-test
    (c) power up
    (d) checking configuration data

29. The details of the boot process might vary slightly from one computer to another, depending upon the instructions contained in:
    (a) RAM.
    (b) ROM.
    (c) BIOS.
    (d) CMOS.

30. The Internet:
    (a) is dedicated solely to education related activities.
    (b) was developed by an executive order of the President of the U.S.A.
    (c) is a service principally available to businesses in 14 countries.
    (d) None of the above are true statements.

31. In the URL http://www.yahoo.com, the "www.yahoo.com" element indicates that this WWW server is maintained by a(n):
    (a) educational institution.
    (b) military installation.
    (c) commercial organization.
    (d) nonmilitary government organization.
    (e) internet access provider.

32. To transfer a file to your computer from a remote computer on the Internet, you would use:
    (a) ftp.
    (b) wais.
    (c) Telnet.
    (d) Gopher.
    (e) None of the above.

33. What is a computer network?
    (a) A collection of computers that use communications channels to share data among many users in different countries.
    (b) A collection of different types of hardware sharing an IPX.
    (c) A collection of workstations and nodes on a backbone.
    (d) A collection of computers and other devices that use communications channels to share data, hardware and software.

34. All of the following are advantages of using shared programs on a network EXCEPT:
    (a) Less disk storage spare is required because only one copy of the program is stored on the file server.
    (b) Shared programs run faster because they are kept in memory on the file server.
    (c) It might be possible to save money by purchasing a concurrent user license or network license for a program.
    (d) It is easier to update a single program stored on the file server than to update copies of the program shared on each workstation.

35. Terminal emulation software enables a microcomputer to:
    (a) act as a terminal and communicate with a host computer.
    (b) become an internet host.
    (c) emulate a mainframe host.
    (d) become a host for a terminal connected to the serial port.
    (e) None of the above.

36. Email messages:

   (a) cannot be sent on a local area network unless they use TCP/IP.

   (b) are the safest and most secure way to send information.

   (c) do not enjoy the same legal protection from snooping as the mail sent via Canada Post.

   (d) cannot contain worksheets, graphics or other special documents.

   (e) expire after 2 weeks if no-one reads them.

37. Which one of the following is **NOT** a common operator error that results in lost data?

   (a) copying a new file over an old file

   (b) using the wrong password to login to the system

   (c) formatting a disk containing important files

   (d) erasing the wrong file

38. Which statement is **FALSE** about the Clipper Chip?

   (a) The Clipper Chip is an encryption standard proposed by the National Security Agency in the US.

   (b) The Clipper Chip is designed so that all messages encrypted with it can be decoded with a special key.

   (c) The Clipper Chip could help law enforcement agents because they could obtain a court order to get the key.

   (d) Some people are against the chip because they feel that the government has no right to require citizens to use a specific encryption method just so the goverment will be able to break it.

   (e) Other people have raised questions about security risks if anyone other than law enforcement officers obtained access to the keys.

   (f) **Trick Question!** All the statements are true.

39. A trojan horse is:

    (a) a program that is triggered when the computer clock reaches a certain date.

    (b) a program that is triggered by the appearance and disappearance of specific data.

    (c) a program that appears to perform one function while actually doing something else.

    (d) a program that is designed to enter a computer system through holes in the security system.

40. Why do we study the mathematical foundations of computing?

    (a) To advance the field of mathematics.

    (b) To understand how computers work.

    (c) To understand what computers can and cannot do.

    (d) To build complex computer hardware and software.

B. Fill in the Blank — 20 marks (1 mark per question)

1. A list of files called a(n) ______________________________ is maintained by the operating system for each disk or CD-ROM.

2. A(n) ______________________________ is approximately 1,024 kilobytes.

3. Floppy disks and hard disks, which are fast and convenient, are preferred storage media because they allow ______________________________ access of data.

4. Platter surfaces of a hard drive are formatted into sectors and ______________________________ that are vertical stacks of tracks.

5. A(n) ______________________________ occurs when the head of a hard disk drive contacts and damages the surface of a platter.

6. You can retrieve data from a(n) ______________________________ , but you cannot save new data to it.

7. The ______________________________ is an operating system file that helps the computer store and retrieve files from disk storage by maintaining a list of files and their location on the disk.

8. Files stored in many nonadjacent clusters are said to be ______________________________ .

9. When you use a Copy command to copy a file from one drive to another, you end up with ________________________ copies of the file.

CONTINUED

10. A(n) ______________________ device operates on continuously varying data.

11. The binary number 1111 is equivalent to the decimal number ______________________

12. Data that is waiting to be processed is held temporarily in ______________________

13. ______________________ consists of chips that contain permanent instructions to help a computer prepare for processing tasks.

14. The ALU uses ______________________ as a place to do its computations.

15. The ALU contains a(n) ______________________ that holds the results of arithmetic operations.

16. A computer contains a system ______________________ that emits pulses to establish the timing for all system operations.

17. A computer with a 32-bit word size, but a 16-bit bus is going to run significantly ______________________ than a computer with a 32-bit word size and a 32-bit bus, even though they both run at the same clock speed.

18. A ______________________ computer has a limited set of instructions that it can perform very quickly.

19. Parallel cables are generally used to connect a computer to a

    ______________________________ .

20. A(n) ______________________________ port transmits data one bit at a time.

C. Artifical Intelligence – 8 marks

Use concise sentences to answer the following questions.

1. **[2 marks]** What is the Turing test?

2. **[2 marks]** How is the ambiguity of the English language relevant to artificial intelligence?

3. **[1 mark]** Which of the following is fundamental to all the other areas of AI?

   (a) knowledge representation

   (b) neural networks

   (c) computer vision

   (d) speech synthesis

   (e) speech recognition

4. **[1 mark]** Give a reason for your decision in the previous question.

5. **[2 marks]** Describe two problems that computer scientists encountered when attempting to build expert systems.

   (a)

   (b)

D. Mathematical Foundations — 7 marks

1. **[4 total marks]** In the following code fragment, notice that the number of times the loops are executed depends on the value of the variable `n`.

```
    .
    .
    .
var n : int
put "please enter an integer"
get n

for i:1..n
  put "hello"
end for

for i: 1..n
  for j: 1..n
    put "ciao"
  end for
end for
   .
   .
   .
```

   (a) **[1 mark]** If a user first runs the above program with a certain value for `n`, and later reruns it with the value of `n` doubled, what happens to the number of times "hello" is printed in the rerun?

   (b) **[1 mark]** What happens to the number of times "ciao" is printed in the rerun?

   (c) **[1 mark]** Using big "O" notation, what is the complexity of the "hello" loop?

   (d) **[1 mark]** Again using big "O" notation, what is the complexity of the "ciao" loop?

(e) **[3 marks]** Describe a cryptographic algorithm that uses factoring and testing for prime numbers to encrypt and decrypt private messages. Use point–form English; be concise.

E. Programming – DAY SECTION ONLY – 25 marks

1. [**3 marks**] Write a Turing program that reads words from the keyboard until the user inputs the word "stop". Note that your program does not need to do anything with the words that are read.

2. [**4 marks**] Write a Turing program that prints out all the odd integers less than 20.

3. **[7 marks]** A mail order company uses the following table to determine how much delivery charge to apply to each order.

total order	additional delivery charge
$< \$10.00$	\$1.00
\$10.00 to \$19.99	\$2.00
\$20.00 to \$39.99	\$3.00
\$40.00 and over	\$4.00

Write a Turing program that inputs an order amount and outputs the additional delivery charge that would apply.

4. **[2 marks]** Make changes to your program for question 3 so that it also outputs the total bill (i.e. the total order + the delivery charge). One way to indicate the changes to your code is to number the lines in your program in question 3, and state the changes in the form "add such and such after line x"; alternately, simply rewrite the program here with the necessary changes.

5. **[6 marks]** The area of a circle with radius r is πr^2; the circle's perimeter is $2\pi r$. Write a Turing program that repeatedly reads (circle) radius values from the user, and calculates and prints the corresponding area and perimeter. Your program should stop when the user enters a 0 radius.

F. Object-Oriented Programming – EVENING SECTION ONLY – 25 marks

1. *Fill–in–the–blanks with Object–Oriented Concepts (5 marks total)*

If a(n) ______________________ is like a cookie cutter, then a cookie is like a(n) ______________________ . The "has–a" relationship is implemented with an OOT ______________________ statement. Another name for the "has–a" relationship is ______________________ . The relationship between an object and its class is ______________________ . The OOT statement that creates an object is ______________________

The female class has a(n) ______________________ relationship with the human class; the OOT statement that corresponds to this relationship is ______________________ . The active part of a class is called a(n) ______________________ ; this entity is implemented in OOT by a(n) ______________________ statement.

2. *Object–Oriented Programming with OOT (20 marks total)*

   Design and write an OOT program that simulates the following: *Bill Clinton bakes chocolate chip cookies.* To make his cookies, Bill uses flour, sugar, eggs, and chocolate chips. Of course, he bakes the cookies in an oven.

   Part A: [10 marks] Draw a Bubble Diagram of your design, which includes the relevant objects, classes, and methods, and the relationships between these entities. Mark each bubble clearly with the appropriate entity. **This is the place to work out the important issues in the problem statement and how to handle these issues BEFORE proceeding to code.**

Part B: [10 marks] Write an OOT program that **implements your Bubble design.** Bill likes to say what he is doing as he prepares and bakes the cookies. Your program should simulate this by outputting appropriate statements along the way, including the final statment that "Bill Clinton bakes chocolate chip cookies". (To receive full marks, use the object–oriented approach; use comments, good naming conventions, and indent your code.)

More space for Part B.

END OF EXAM