Introduction to Computer Science

Third Exam 5/23/2005

1. (a) (6%) Describe the advantage and disadvantage of the waterfall model and prototyping model for the software engineering.

(b) (4 %) What is the difference between coupling and cohesion? Which should be minimized and which should be maximized? Why?

2. (18 %) Answer the following questions in relation to the accompanying structure chart on Fig.1

(a) (3 %) To which module does module Y return control?

(b) (3 %) To which module does module Z return control?

(c) (3 %) Are modules W and X linked via control coupling?

(d) (3 %) Are modules W and X linked via data coupling?

(e) (3 %) What data is shared by both module W and module Y?

(f) (3 %) In what way are modules Y and X related?

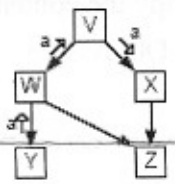

Fig 1.

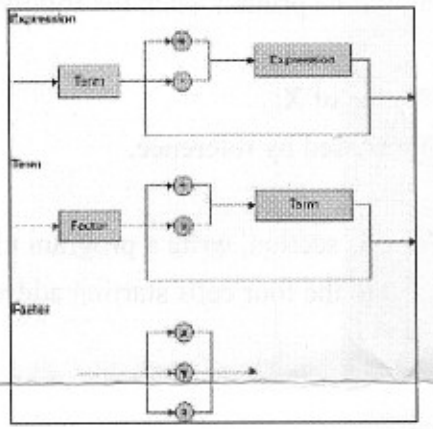

Fig.2

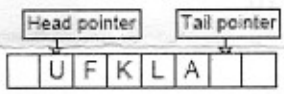

Fig. 3

3 . (5 %) Based on the syntax diagram shown on Fig. 2,
please draw the parse trees for the expressions:
$x \times y + y \div x$.

4. (a) (6 %) Suppose a queue implemented in a circular fashion is in the state shown in Fig. 3. Draw a diagram showing the structure after the letters G and R areinserted, three letters are removed, and the letters D and P are inserted.(b) (6 %) What error occurs in part (a) if the letters G, R, D, and P are inserted before any letters are removed?

5. (10 %) Resolve the collection of statements: (Q OR ¬R), (T OR R), ¬P, (P OR ¬T), (P OR ¬Q), to show these statements are indeed inconsistent.

6. (10 %) Suppose two arrays of 6 integers are used to implement a stack and a circular queue, respectively. Both structures are initially empty. After consecutive operations of inserting 35, inserting 38, removing one item, inserting 63, inserting 24, removing one item, inserting 7, inserting 12, removing one item, inserting 30, inserting 68, and inserting 17, on both structures, what are the contents stored in both arrays? (Please indicate clearly what the pointers point to.)

7. (10 %) The table below represents a portion of a computer's main memory containing a binary tree stored row by row in a contiguous block as described in the chapter. Draw a picture of the tree.

Address	Contents
50	A
51	B
52	C
53	D
54	E
55	F
56	G

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procedure modify (Y)
  assign Y the value 7;
  print the value of Y.
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8. Suppose the procedure modify is defined on the right.

(a) (4 %) If parameters are passed by value, what will be printed when the following program segment is executed?

assign X the value 5; apply modify to X; print the value of X;

(b) (4 %) Repeat (a) in the case of parameters being passed by reference.

9. (8%)Using the extensions described at the end of this section, write a program to copy the contents of four consecutive memory cells starting at address C0 to the four cells starting address D0. Assume your program starts at address 10.

10. (5%) Summary the difference between a flat file and a database.

11. (4%) Explain immediate addressing and direct addressing?

Op-code	Operand	Description
1	RXY	LOAD the register R with the bit pattern found in the memory cell whose address is XY. **Example:** 14A3 would cause the contents of the memory cell located at address A3 to be placed in register 4.
2	RXY	LOAD the register R with the bit pattern XY. **Example:** 20A3 would cause the value A3 to be placed in register 0.
3	R0S	STORE the data pointed by the pointer found in register S to register R. **Example:** 3R0S would cause the contents pointed by pointer in register S to be copied into register R.
4	R0S	STORE the contents of register R into the memory cell pointed by register S. **Example:** 4R0S would cause the contents in register R to be copied into memory cell pointed by register S.
5	RST	ADD the bit patters in registers S and T as though they were two's complement representations and leave the result in register R. **Example:** 5726 would cause the binary values in registers 2 and 6 to be added and the sum placed in register 7.
6	RXY	JUMP to the instruction located in the memory cell at address XY if the bit pattern in register R is equal to the bit pattern in register number 0. Otherwise, continue with the normal sequence of execution. **Example:** 643C would first compare the contents of register 4 with the contents of register 0. If the two were equal, the pattern 3C would be placed in the program counter so that the next instruction executed would be the one located at that memory address. Otherwise nothing would be done and program execution would continue in its normal sequence.