Introduction to Computer Science (2018-01-09)
Final Exam (Closed Book)

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1. (10%) Rewrite the following program using a **while** structure rather than a **repeat** structure. Be sure the new version prints the same values as the original.

```
num=100
repeat:
 print(num)
 num=num-1
 until (num<0)
```

2. (9%) Identify the termination condition in each of the following iterative statements.

找出結束條件

(a) while (count < 5):

```
...
```

(b) repeat:

```
...
until (count==1)
```

(c) while ((count < 5) and (total <56))

```
...
```

3. (10%) Design an algorithm to generate the sequence of positive integers (in increasing order) whose only prime divisors are 2 and 3; that is, your algorithm should produce the sequence 2, 3, 4, 6, 8, 9, 12, 16, 18, 24, 27, ...

4. (10%) Why is a contiguous list considered to be a convenient storage structure for implementing static lists, but not for implementing dynamic lists? Explain your answer.

5. (10%) Suppose you want to insert the number 3 in the list of numbers 1, 2, 4, 5, 6, 7, 8. What activities are required to insert the number 3 in the list, assuming that the order of the list is to be maintained?

6. (18%) The following table represents the contents of some cells in a computer's main memory along with the address of each cell represented. Note that some of the cells contain letters of the alphabet, and each such cell is followed by an empty cell.

(a) (15%) Place addresses in these empty cells so that each cell containing a letter together with the following cell form an entry in a linked list in which the letters appear in alphabetical order. (Use zero for the null pointer.)

(b) (3%) What address should the head pointer contain?

address	contents
11	C
12	
13	G
14	
15	E
16	
17	B
18	
19	U
20	
21	F
22	

7. (12%) In terms of the relations shown below, what is the appearance of the relation FINAL after executing each of these instructions:

A relation

L	M	N
X	P	1
Y	Q	7
Z	R	6

B relation

X	Y
9	7
4	3

(a) FINAL←SELECT from B where X = 9

(b) FINAL←PROJECT L from A

(c) FINAL←SELECT from A where L = Z

(d) FINAL←JOINT A and B where A.N = B.Y

select row 列 橫
project column 行 直

8. (12%) Using the commands SELECT, PROJECT, and JOIN, write a sequence of instructions to answer each of the following questions about branches and their courses in terms of the following database:

Course relation

CName	ID
Networks	IT655
DataBase	CS543
VLSI	EC653

Branch relation

BName	ID	Credits
Computer Science	CS543	4
Computer Science	EC653	5
Electronics & Communication	IT655	4
Electronics & Communication	EC653	5
Information Technology	CS543	4
Information Technology	IT655	4

(a) Which branches offer IT655?

(b) List all the branches present in Branch relation.

(c) Which branches offer 4-credit courses?

9. (9%) Draw a flowchart representing an algorithm to determine whether an integer x is a △ prime or not.

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