

2021 2 학기

자료구조개론

중간고사

Caution

1. Following lines are all included in the program, but omitted due to page limitation

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>
#include <string.h>
```

2. All variables and arrays in program are initialized with zeros at the beginning.

ex 1) int i; double d; => i and d is initialized with 0

ex 1) char s[100]; => all the values are 0 at the start

ex 2) char s = (char*)malloc(100); -> all the values in s is initialized with 0 when allocated

Q1. Solve the problem related to the following problem

```
#define SWAP(x, y, t) ((t) = (x), (x) = (y), (y) = (t))

void sort(int list[], int n)
{
    int i, j, temp;
    int for_count = 0;
    for(i = 1; i < n; i++) {
        for (j = i - 1; j >= 0; j--) {
            if(list[j + 1] < list[j])
                SWAP(list[j + 1], list[j], temp);
            for_count++;
        }
    }
    printf("%d\n", for_count); B
}
```

```
void main(void) {
    int n = 15;
    int list[] = {1, 3, 15, 17, 3, 2, 7, 11, 9, 10, 5, 8, 3, 5, 3};
    sort(list, n);
}
```

- a. What is time complexity of the sort program? (array len -> n)
① $\Theta(1)$ ② $\Theta(n)$ ③ $\Theta(\log n)$ ④ $\Theta(n \log n)$ ⑤ $\Theta(n^2)$

- b. What is the name of this sort method
 - ① Selection sort
 - ② Insertion sort
 - ③ Bubble sort
 - ④ Quick sort
 - ⑤ Merge sort

- c. What is the value of list[12] after sort
① 1 ② 3 ③ 9 ④ 11 ⑤ 15

- d. What is the value of list[3] after sort
① 3 ② 5 ③ 9 ④ 15 ⑤ 17

- e. When i is 10 and j is 6, what is the value of list[4] when program is at **(A)**
① 7 ② 20 ③ 9 ④ 10 ⑤ 1

- f. When i is 7 and j is 3, what is the value of list[2] when program is at **(A)**
① 5 ② 20 ③ 3 ④ 10 ⑤ 1

g. What is the output of the printf at **(B)**

① 86 ② 97 ③ 105 ④ 113 ⑤ 120

h. How many times **SWAP** called in this program

① 48 ② 49 ③ 50 ④ 51 ⑤ 52

Q2. Solve the problem related to the following problem

```
#define MAX_TERMS 101
#define MAX_COL 10
typedef struct {
    int col;
    int row;
    int value;
} term;
```

	row	col	value
a[0]	7	8	12
a[1]	1	0	-3
a[2]	4	3	24
a[3]	0	2	13
a[4]	3	1	-2
a[5]	0	3	4
a[6]	0	6	-5
a[7]	5	2	34
a[8]	2	2	-79

```
void fasttranspose(term a[], term b[]) {
    int rowTerms[MAX_COL], startPos[MAX_COL];
    int i, j, numCol = a[0].col, numTerms = a[0].value;
    b[0].row = numCol; b[0].col = a[0].row;
    b[0].value = numTerms;
    if (numTerms > 0) {
        for(i=0; i<numCol; i++)
            rowTerms[i] = 0;
        for(i=1; i<=numTerms; i++)
            rowTerms[a[i].col]++;
    }
}
```

(A)

```
startPos[0] = 1;
for(i=1; i<numCol; i++)
    startPos[i] =
        startPos[i-1] + rowTerms[i-1];
```

(B)

```
for(i=1; i<=numTerms; i++) {
    j=startPos[a[i].col]++;
    b[j].row = a[i].col; b[j].col = a[i].row;
    b[j].value = a[i].value;
}
```

(C)

```
}
```

```
int main(int argc, char *argv[]) {
    term a[MAX_TERMS], b[MAX_TERMS];
    /* a is initialized with upper value */
    fasttranspose(a, b);
}
```

- a. What is the value of b[2].row after fasttranspose?
① 0 ② 1 ③ 2 ④ 3 ⑤ 8
- b. What is the value of b[6].value after fasttranspose?
① 12 ② 24 ③ -2 ④ -5 ⑤ -79
- c. What is the value of b[7].value after fasttranspose?
① -3 ② 13 ③ 4 ④ 34 ⑤ -79
- d. What is the value of the rowTerms[1] when program is at (A)
① 0 ② 1 ③ 2 ④ 3 ⑤ 4
- e. What is the value of the rowTerms[5] when program is at (A)
① 0 ② 1 ③ 2 ④ 3 ⑤ 4
- f. What is the value of the startPos[2] when program is at (B)
① 4 ② 5 ③ 6 ④ 7 ⑤ 8
- g. What is the value of the startPos[6] when program is at (B)
① 9 ② 10 ③ 11 ④ 12 ⑤ 13
- h. What is the value of the startPos[2] when program is at (C)
① 9 ② 10 ③ 11 ④ 12 ⑤ 13
- i. What is the value of the startPos[6] when program is at (C)
① 9 ② 10 ③ 11 ④ 12 ⑤ 13
- j. What is the time complexity of this program (termNum -> n)?
① $\Theta(1)$ ② $\Theta(n)$ ③ $\Theta(\log n)$ ④ $\Theta(n \log n)$ ⑤ $\Theta(n^2)$

Q3. Solve the problem related to the following problem

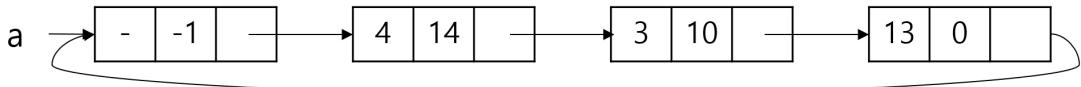
```
#define COMPARE(x,y) ((x)<(y)?-1:(x)==(y)?0:1)

typedef struct polyNode *polyPointer;
struct polyNode {
    int coef;
    int expon;
    polyPointer link;
};

polyPointer cpadd (polyPointer a, polyPointer b);
int length (polyPointer last) {
    polyPointer temp;
    int count = 0;
    if (last) {
        temp = last;
        do {
            count++;
            temp = temp->link;
        } while (temp != last);
    }
    return count;
}
void attach(float coefficient,
           int exponent, polyPointer *ptr) {
    polyPointer temp;
    temp =
        (polyPointer)malloc(sizeof(struct polyNode));
    temp->coef = coefficient;
    temp->expon = exponent;
    (*ptr)->link = temp;
    *ptr = temp;
}
void main() {
    polyPointer a,b, c;
    polyPointer init_a,init_b;
    /* a, b is initialized with format below */
    /* check the actual value in problem */
    c= cpadd(a, b);
    printf("%d\n", length(c)); (A)
}
```

```
polyPointer cpadd (polyPointer a, polyPointer b) {
    polyPointer startA, c, lastC;
    int sum, done = 0;
    int else_count = 0;
    startA = a;
    a = a->link;
    b = b->link;
    c = (polyPointer)malloc(sizeof(struct polyNode));
    c->expon = -1;
    lastC = c;
    do {
        switch (COMPARE(a->expon, b->expon)) {
            case -1:
                attach(b->coef,b->expon,&lastC);
                b = b->link;
                break;
            case 0:
                if (startA == a) done = 1;
                else {
                    sum = a->coef + b->coef;
                    if (sum) attach(sum,a->expon,&lastC);
                    else else_count++;
                    a = a->link; b = b->link;
                }
                break;
            case 1:
                attach(a->coef,a->expon,&lastC);
                a = a->link;
        }
    } while (!done);
    lastC->link =c;
    printf("else_count : %d\n", else_count); (B)
    return c;
}
```

$$A(x) = 4x^{14} + 3x^{10} + 13$$



a. If $A(x) = 4x^{14} + 3x^{10} + 13$, $B(x) = -2x^{14} + x^7 + 25x^2$,

what is output of the printf at line **(A)**

- ① 5 ② 6 ③ 7 ④ 8 ⑤ 9

b. If $A(x) = 4x^{14} + 3x^{10} + 13$, $B(x) = -2x^{14} + x^7 + 25x^2$,

what is output of the printf at line **(B)**

- ① 0 ② 1 ③ 2 ④ 3 ⑤ 4

c. If $A(x) = 4x^{14} + 3x^{10} + 13$, $B(x) = -2x^{14} + x^7 + 25x^2$,

what is the value of c->link->link->link->link->link->expon

- ① 0 ② 3 ③ 9 ④ 19 ⑤ 20

d. If $A(x) = 2x^{25} + 16x^7 - 3x^2 + x$, $B(x) = 2x^{10} - 33x^3$,

what is output of the printf at line **(A)**

- ① 5 ② 6 ③ 7 ④ 8 ⑤ 9

e. If $A(x) = 2x^{25} + 16x^7 - 3x^2 + x$, $B(x) = 2x^{10} - 33x^3$,

what is output of the printf at line **(B)**

- ① 0 ② 3 ③ 9 ④ 19 ⑤ 20

f. If $A(x) = 2x^{25} + 16x^7 - 3x^2 + x$, $B(x) = 2x^{10} - 33x^3$,

what is the value of c->link->link->link->link->link->expon

- ① 0 ② 2 ③ 4 ④ 8 ⑤ 14

g. If $A(x) = x^3 + 3x^2 + 3x^1 + 1$, $B(x) = -x^3 - 2x^2 - 1$,

what is output of the printf at line **(A)**

- ① 0 ② 1 ③ 2 ④ 3 ⑤ 4

h. If $A(x) = x^3 + 3x^2 + 3x^1 + 1$, $B(x) = -x^3 - 2x^2 - 1$,

what is output of the printf at line **(B)**

- ① 0 ② 1 ③ 2 ④ 3 ⑤ 4

- i. If $A(x) = x^3 + 3x^2 + 3x^1 + 1$, $B(x) = -x^3 - 2x^2 - 1$,
what is the value of c->link->link->link->link->link->expon
① -1 ② 0 ③ 1 ④ 2 ⑤ 3
- j. What is time complexity of the pmatch program? ($A(x)$ term $\rightarrow n$, $B(x)$ term $\rightarrow m$)
① $\Theta(1)$ ② $\Theta(n)$ ③ $\Theta(n+m)$ ④ $\Theta(n*m)$ ⑤ $\Theta(n^2)$

Q4. Solve the problem related to the following problem

<pre>#define MAX_STACK_SIZE 1000 #define MAX_ROWS 8 #define MAX_COLS 8 #define EXIT_ROW 6 #define EXIT_COL 6 typedef struct __element{ int row; int col; int dir; }element; typedef element elements; typedef struct __offset{ int vert; int horiz; }offset; elements stack[MAX_STACK_SIZE]; offset move[8]; int maze[MAX_ROWS][MAX_COLS]; int mark[MAX_ROWS][MAX_COLS]; int top; void path(void); element pop(void){ return stack[top--]; } void push(element e){ stack[top++] = e; } int main(void) { path(); }</pre>	<pre>void path(void){ /* output a path through the maze if such a path exists*/ int i, row, col, nextRow, nextCol, dir = 0; int found = false; int total_tries = 0; int right_path_tries = 0; element position; mark[1][1]=1; top=0; stack[0].row=1; stack[0].col=1; stack[0].dir=0; while (top>-1 && !found) { position = pop(); row = position.row; col = position.col; dir= position.dir; while (dir< 8 && !found) { /* move in direction dir*/ nextRow= row + move[dir].vert; nextCol= col + move[dir].horiz; A if (nextRow==EXIT_ROW && nextCol==EXIT_COL) found = true; else if (!maze[nextRow][nextCol] && !mark[nextRow][nextCol]){ mark[nextRow][nextCol] = 1; position.row= row; position.col= col; position.dir= ++dir; push(position); row = nextRow; col = nextCol; dir= 0; right_path_tries++; } } } }</pre>
---	---

```

/* Continued from path function */
    else{
        ++dir;
    }
    total_tries++;
} /* while (dir< 8 & !found) */
} /* while (top>-1 && !found) */
if (found) {
    printf("The path is:\n");
    printf("row  col\n");
    for (i=0; i<top; i++)
        printf("%2d%5d\n", stack[i].row,
               stack[i].col);
    printf("%2d%5d\n", row, col);
    printf("%2d%5d\n", EXIT_ROW, EXIT_COL);
}
else{
    printf("The maze does not have a
path\n");
}

printf("total_tries : %d\n", total_tries); B
printf("right_path_tries : %d\n",
       right_path_tries); C
}

```

Maze								
Indices	0	1	2	3	4	5	6	7
0	1	1	1	1	1	1	1	1
1	1	0	0	0	1	0	1	1
2	1	0	1	0	0	1	1	1
3	1	0	1	0	1	1	0	1
4	1	0	1	1	0	1	0	1
5	1	0	0	1	0	0	1	1
6	1	1	0	1	0	0	0	1
7	1	1	1	1	1	1	1	1

Move		
	vert	horiz
0	0	1
1	1	1
2	1	0
3	1	-1
4	0	-1
5	-1	-1
6	-1	0
7	-1	1

What is result of the printf at line **A**

a. What point is not in the path

- ① (1, 2) ② (1, 3) ③ (3, 3) ④ (5, 5) ⑤ (6, 5)

b. What is the value of position.dir when nextRow is 1 and nextCol is 3 at **A**

- ① 0 ② 1 ③ 2 ④ 3 ⑤ 4

c. What is the value of position.dir when nextRow is 4 and nextCol is 5 at **A**

- ① 0 ② 1 ③ 2 ④ 3 ⑤ 4

d. What is the result of the printf at line **(B)**
① 12 ② 13 ③ 14 ④ 15 ⑤ 16

e. What is the result of the printf at line **(C)**
① 6 ② 7 ③ 8 ④ 9 ⑤ 10

f. Suppose maze[5][5] = 1, then
What point is not in the path
① (1, 2) ② (1, 3) ③ (2, 3) ④ (5, 4) ⑤ (6, 5)

g. Suppose maze[5][5] = 1, then
What is the value of position.dir when nextRow is 1 and nextCol is 2 at **(A)**
① 0 ② 1 ③ 2 ④ 3 ⑤ 4

h. Suppose maze[5][5] = 1, then
What is the value of position.dir when nextRow is 3 and nextCol is 5 at **(A)**
① 0 ② 1 ③ 2 ④ 3 ⑤ 4

i. Suppose maze[5][5] = 1, then
What is the result of the printf at line **(B)**
① 12 ② 13 ③ 14 ④ 15 ⑤ 16

j. Suppose maze[5][5] = 1, then
What is the result of the printf at line **(C)**
① 6 ② 7 ③ 8 ④ 9 ⑤ 10

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중간고사

Caution

1. Following lines are all included in the program, but omitted due to page limitation

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>
#include <string.h>
```

2. All variables and arrays in program are initialized with zeros at the beginning.

ex 1) int i; double d; => i and d is initialized with 0

ex 1) char s[100]; => all the values are 0 at the start

ex 2) char s = (char*)malloc(100); -> all the values in s is initialized with 0 when allocated

정답입니다

우체로 배포될 것

다음과 같은 문제를 풀어보시오

Q1. Solve the problem related to the following problem

```
#define SWAP(x, y, t) ((t) = (x), (x) = (y), (y) = (t))
void sort(int list[], int n)
{
    int i, j, temp;
    int for_count = 0;
    for(i = 1; i < n; i++) {
        for (j = i - 1; j >= 0; j--) {
            if(list[j + 1] < list[j]) {
                SWAP(list[j + 1], list[j], temp);
                for_count++;
            }
        }
    }
    printf("%d\n", for_count);
}
```

A 버블정렬의 시간복잡도는 $O(n^2)$

```
void main(void) {
    int n = 15;
    int list[] = {1, 3, 15, 17, 3, 2, 7, 11, 9, 10, 5, 8, 3, 5, 3};
    sort(list, n);
}
```

B 버블정렬의 시간복잡도는 $O(n^2)$

a. What is time complexity of the sort program? (array len -> n)

- ① $\Theta(1)$ ② $\Theta(n)$ ③ $\Theta(\log n)$ ④ $\Theta(n \log n)$ ⑤ $\Theta(n^2)$

b. What is the name of this sort method

- ① Selection sort
 ② Insertion sort
 ③ Bubble sort
 ④ Quick sort
 ⑤ Merge sort

c. What is the value of list[12] after sort

- ① 1 ② 3 ③ 9 ④ 11 ⑤ 15

d. What is the value of list[3] after sort

- ① 3 ② 5 ③ 9 ④ 15 ⑤ 17

e. When i is 10 and j is 6, what is the value of list[4] when program is at **(A)**

- ① 7 ② 20 ③ 9 ④ 10 ⑤ 1

정답은 list[6]가 list[7]를 바꾸고 있을 때였지만 그 아래에는 마지막으로

이 두 줄에 정답이
아래는 대체로 이런
꼴이 되도록 넣을 것 같았습니다.

f. When i is 7 and j is 3, what is the value of list[2] when program is at **(A)**

- ① 5 ② 20 ③ 3 ④ 10 ⑤ 1

주제(주제) | 풍경(경치) | 묘사

- g. What is the output of the printf at **(B)**

① 86

② 97

105

④ 113

⑤ 120

- h. How many times **SWAP** called in this program /

① 48

② 49

③ 50

51

⑤ 52

× 예를 정령이란 암울한 두 눈을 빠져나와 정령하는 방법이다. 원인은 속으로 빠져나와서 헌(한 작는) 원을
무엇으로 개선해야 올바르게 정령할 수 있단다.

도제는 이와 같은 기본적인
형태를 갖으면 되고
내용에 따라면 다른 경우
갖으면 좋다

value가 12인 a[0] 가지 찾아
 하기 어렵지? 그걸 생각해보면
 그 행에 있는 value를 다 찾았어
 찾은 것 10을 보면 행에 있는 12에는
 놓여있고 개수를 카운트해보면 10

$a[i]$ 는稠密 matrix처럼
 0이 아님을 알면 행과 열은
 row, col, value의
 행과 열을 찾는다.

Q2. Solve the problem related to the following problem

```
#define MAX_TERMS 101
#define MAX_COL 10
typedef struct {
  int col;
  int row;
  int value;
} term;
```

Sparse Matrix의 transpose를 위한 문제를 풀어보자.

두 가지 sparse matrix를 갖고 하위 sparse matrix를 만들고자 한다.

	row	col	value
a[0]	7	8	12
a[1]	1	0	-3
a[2]	4	3	24
a[3]	0	2	13
a[4]	3	1	-2
a[5]	0	3	4
a[6]	0	6	-5
a[7]	5	2	34
a[8]	2	2	-79

```
void fasttranspose(term a[], term b[]) {
  int rowTerms[MAX_COL], startPos[MAX_COL];
  int i, j, numCol = a[0].col, numTerms = a[0].value;
  b[0].row = numCol; b[0].col = a[0].row;
  b[0].value = numTerms;
  if (numTerms > 0) {
    for(i=0; i<numCol; i++)
      rowTerms[i] = 0;
    for(i=1; i<=numTerms; i++)
      rowTerms[a[i].col]++;
  }
}
```

(A)

```
startPos[0] = 1;
startPos[1] = 1+1 = 2;
startPos[2] = 2+1 = 3;
startPos[3] = 3+3 = 6;
startPos[4] = 6+2 = 8;
```

(B)

```
for(i=1; i<=numTerms; i++) {
  j=startPos[a[i].col]++;
  b[j].row = a[i].row; b[j].col = a[i].col;
  b[j].value = a[i].value;
}
```

(C)

```
}
```

```
int main(int argc, char *argv[]) {
  term a[MAX_TERMS], b[MAX_TERMS];
```

/* a is initialized with upper value */

fasttranspose(a, b);

} (A) transpose를 b에 적용하는 과정

int numCol=a[0].col 행렬 A의 열
열 수를 카운트하는 과정

	row	col	value
--	-----	-----	-------

b[0] 8 1 12

b[1]

b[2] 0 1 -3

b[3] 1 3 -2

b[4] 2 0 13

b[5] 2 5 24

b[6] 2 2 -79

b[7] 3 4 24

b[8] 3 0 4

b[9] 6 0 -5

b[10]

b[11]

b[12]

	row	col
b[0]	2	3
b[1]	3	6
b[2]	6	8
b[3]	8	8
b[4]	8	9
b[5]	9	9
b[6]	9	9

- a. What is the value of $b[2].row$ after fasttranspose?
 ① 0 ② 1 ③ 2 ④ 3 ⑤ 8 
- b. What is the value of $b[6].value$ after fasttranspose?
 ① 12 ② 24 ③ -2 ④ -5 ⑤ -79
- c. What is the value of $b[7].value$ after fasttranspose?
 ① -3 ② 13 ③ 4 ④ 34 ⑤ -79
- d. What is the value of the $rowTerms[1]$ when program is at Ⓐ
 ① 0 ② 1 ③ 2 ④ 3 ⑤ 4
- e. What is the value of the $rowTerms[5]$ when program is at Ⓐ
 ① 0 ② 1 ③ 2 ④ 3 ⑤ 4
- f. What is the value of the $startPos[2]$ when program is at Ⓑ
 ① 4 ② 5 ③ 6 ④ 7 ⑤ 8
- g. What is the value of the $startPos[6]$ when program is at Ⓑ
 ① 9 ② 10 ③ 11 ④ 12 ⑤ 13
- h. What is the value of the $startPos[2]$ when program is at Ⓒ
 ① 9 ② 10 ③ 11 ④ 12 ⑤ 13
- i. What is the value of the $startPos[6]$ when program is at Ⓒ
 ① 9 ② 10 ③ 11 ④ 12 ⑤ 13
- j. What is the time complexity of this program ($termNum \rightarrow n$)?
 ① $\Theta(1)$ ② $\Theta(n)$ ③ $\Theta(\log n)$ ④ $\Theta(n \log n)$ ⑤ $\Theta(n^2)$

문제 오류

2

Q3. Solve the problem related to the following problem

```
#define COMPARE(x,y) ((x)<(y)?-1:(x)==(y)?0:1)

typedef struct polyNode *polyPointer;
struct polyNode {
    int coef;
    int expon;
    polyPointer link;
};

polyPointer cpadd (polyPointer a, polyPointer b);
int length (polyPointer last) {
    polyPointer temp;
    int count = 0;
    if (last) {
        temp = last;
        do {
            count++;
            temp = temp->link;
        } while (temp != last);
    }
    return count;
}

void attach(float coefficient,
           int exponent, polyPointer *ptr) {
    polyPointer temp;
    temp =
        (polyPointer)malloc(sizeof(struct polyNode));
    temp->coef = coefficient;
    temp->expon = exponent;
    (*ptr)->link = temp;
    *ptr = temp;
}

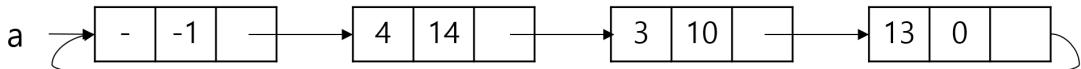
void main() {
    polyPointer a,b, c;
    polyPointer init_a,init_b;
    /* a, b is initialized with format below */
    /* check the actual value in problem */
    c= cpadd(a, b);

    printf("%d\n", length(c)); (A)
}
```

at b TDM C

```
polyPointer cpadd (polyPointer a, polyPointer b) {
    polyPointer startA, c, lastC;
    int sum, done = 0;
    int else_count = 0;
    startA = a;
    a = a->link;
    b = b->link;
    c = (polyPointer)malloc(sizeof(struct polyNode));
    c->expon = -1;
    lastC = c;
    do {
        switch (COMPARE(a->expon, b->expon)) {
            case -1:
                attach(b->coef,b->expon,&lastC);
                b = b->link;
                break;
            case 0: startA == a done = 1
                if (startA == a) done = 1;
                else {
                    sum = a->coef + b->coef;
                    if (sum) attach(sum,a->expon,&lastC);
                    else else_count++; done = 0
                    a = a->link; b = b->link;
                }
                break;
            case 1:
                attach(a->coef,a->expon,&lastC);
                a = a->link;
        }
    } while (!done);
    lastC->link =c;
    printf("else_count : %d\n", else_count); (B)
    return c;
}
```

$$A(x) = 4x^{14} + 3x^{10} + 13$$



a. If $A(x) = \cancel{4x^{14} + 3x^{10} + 13}$, $B(x) = -\cancel{2x^{14}} + x^7 + 25x^2$,

what is output of the printf at line **(A)**

① 5

② 6

③ 7

④ 8

⑤ 9

b. If $A(x) = 4x^{14} + 3x^{10} + 13$, $B(x) = -2x^{14} + x^7 + 25x^2$,

what is output of the printf at line **(B)**

① 0

② 1

③ 2

④ 3

⑤ 4

c. If $A(x) = 4x^{14} + 3x^{10} + 13$, $B(x) = -2x^{14} + x^7 + 25x^2$,

what is the value of $(c \rightarrow \text{link}) \rightarrow \text{link} \rightarrow \text{link} \rightarrow \text{link} \rightarrow \text{link} \rightarrow \text{expon}$

① 0

② 3

③ 9

④ 25

⑤ 20

d. If $A(x) = 2x^{25} + 16x^7 - 3x^2 + x$, $B(x) = 2x^{10} - 33x^3$,

what is output of the printf at line **(A)**

① 5

② 6

③ 7

④ 8

⑤ 9

e. If $A(x) = 2x^{25} + 16x^7 - 3x^2 + x$, $B(x) = 2x^{10} - 33x^3$,

what is output of the printf at line **(B)**

① 0

② 3

③ 9

④ 19

⑤ 20

f. If $A(x) = 2x^{25} + 16x^7 - 3x^2 + x$, $B(x) = 2x^{10} - 33x^3$,

what is the value of $(c \rightarrow \text{link}) \rightarrow \text{link} \rightarrow \text{link} \rightarrow \text{link} \rightarrow \text{link} \rightarrow \text{expon}$

① 0

② 2

③ 4

④ 8

⑤ 14

g. If $A(x) = x^3 + 3x^2 + 3x^1 + 1$, $B(x) = -x^3 - 2x^2 - 1$,

what is output of the printf at line **(A)**

① 0

② 1

③ 2

④ 3

⑤ 4

h. If $A(x) = x^3 + 3x^2 + 3x^1 + 1$, $B(x) = -x^3 - 2x^2 - 1$,

what is output of the printf at line **(B)**

① 0

② 1

③ 2

④ 3

⑤ 4

③

$$x^2 + 3x$$

$$2x^{14} + 3x^{10} + x^7 + 25x^2 + 13$$

at 0

$$2x^{25} + 2x^{10} + 16x^7 - 3x^3 - 3x^2 + x$$

$\vdash, \lambda^2 + 3\lambda$

① ②
③ ④ ⑤
③

- i. If $A(x) = x^3 + 3x^2 + 3x^1 + 1$, $B(x) = -x^3 - 2x^2 - 1$,
what is the value of $(c \rightarrow \text{link}) \rightarrow \text{link} \rightarrow \text{link} \rightarrow \text{link} \rightarrow \text{link} \rightarrow \text{expon}$
- ① -1 ② 0 ③ 1 ④ 2 ⑤ 3

- j. What is time complexity of the pmatch program? ($A(x)$ term $\rightarrow n$, $B(x)$ term $\rightarrow m$)
- ① $\Theta(1)$ ② $\Theta(n)$ ③ $\Theta(n+m)$ ④ $\Theta(n^m)$ ⑤ $\Theta(n^2)$

✗

1. 어떤 시점에서 top의 값은 얼마인가?라는 문제에 대해

Q4. Solve the problem related to the following problem

direction 방향을 나타냄

```
#define MAX_STACK_SIZE 1000
#define MAX_ROWS 8
#define MAX_COLS 8
#define EXIT_ROW 6
#define EXIT_COL 6

typedef struct _element{
    int row;
    int col;
    int dir;
}element;
typedef element elements;
typedef struct _offset{
    int vert;
    int horiz;
}offset;
elements stack[MAX_STACK_SIZE];
offset move[8];
int maze[MAX_ROWS][MAX_COLS];
int mark[MAX_ROWS][MAX_COLS];
int top;

void path(void); ❷ ❸ ❹ 정의
```

```
element pop(void){
    return stack[top--]; }
```

```
void push(element e){
    stack[top++] = e;
}
int main(void)
{
    path();
}
```

```
void path(void){
/* output a path through the maze if such a
path exists*/
int i, row, col, nextRow, nextCol, dir = 0;
int found = false;
int total_tries = 0;
int right_path_tries = 0;
element position;
mark[1][1]=1; ❶ ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
top=0;
stack[0].row=1; stack[0].col=1; stack[0].dir=0;
while (top>-1 && !found) {
    position = pop(); } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
    row = position.row; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
    col = position.col; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
    dir= position.dir; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
    while (dir< 8 && !found) { } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
        /* move in direction dir*/ } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
        nextRow= row + move[dir].vert; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
        nextCol= col + move[dir].horiz; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
        A ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
        if (nextRow==EXIT_ROW &&
            nextCol==EXIT_COL)
            found = true; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
        else if (!maze[nextRow][nextCol] == 0 이면 ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
            && !mark[nextRow][nextCol]) { } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
            mark[nextRow][nextCol] = 1; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
            position.row= row; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
            position.col= col; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
            position.dir= ++dir; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
            push(position); } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
            row = nextRow; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
            col = nextCol; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
            dir= 0; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
            right_path_tries++; } ❷ ❸ ❹ ❺ ❻ ❽ ❾ ❿
```

$\text{stack}[1] = 1, 1, 1$
 $\text{stack}[2] = 1, 2, 1$
 $\text{stack}[3] = 1, 3, 2$
 $\text{stack}[4] = 2, 4, 4$
 $\text{stack}[5] = 3, 3, 2$
 $\text{stack}[6] = 4, 4, 2$

```

/* Continued from path function */
else{
    ++dir;
}
total_tries++;
} /* while (dir < 8 & !found) */
} /* while (top > -1 && !found) */

if (found) {
    printf("The path is:\n");
    printf("row col\n");
    for (i=0; i<top; i++)
        printf("%2d%5d\n", stack[i].row,
               stack[i].col);
    printf("%2d%5d\n", row, col);
    printf("%2d%5d\n", EXIT_ROW, EXIT_COL);
}
else{
    printf("The maze does not have a
path\n");
}

printf("total_tries : %d\n", total_tries); (B)
printf("right_path_tries : %d\n",
       right_path_tries); (C)
}

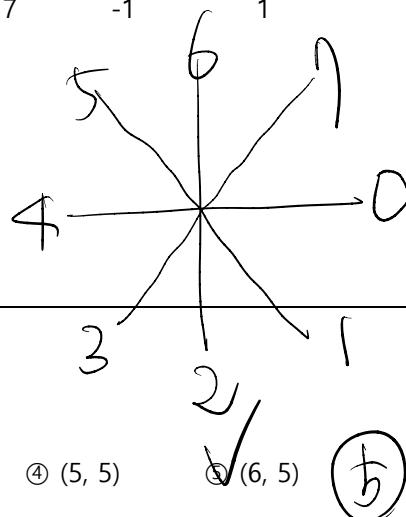
```

Maze

Indices	0	1	2	3	4	5	6	7
0	1	1	1	1	1	1	1	1
1	1	0	0	0	1	0	1	1
2	1	0	1	0	0	1	1	1
3	1	0	1	0	1	1	0	1
4	1	0	1	1	0	1	0	1
5	1	0	0	1	0	0	1	1
6	1	1	0	1	0	0	0	1
7	1	1	1	1	1	1	1	1

Move

	vert	horiz
0	0	1
1	1	1
2	1	0
3	1	-1
4	0	-1
5	-1	-1
6	-1	0
7	-1	1



What is result of the printf at line **(A)**

- a. What point is not in the path

- ① (1, 2) ② (1, 3) ③ (3, 3) ④ (5, 5) ⑤ (6, 5)

⑤ (6, 5)

- b. What is the value of position.dir when nextRow is 1 and nextCol is 3 at **(A)**

- ① 0 ② 1 ③ 2 ④ 3 ⑤ 4

- c. What is the value of position.dir when nextRow is 4 and nextCol is 5 at **(A)**

- ① 0 ② 1 ③ 2 ④ 3 ⑤ 4



- d. What is the result of the printf at line **(B)**
- ① 12 ② 13 ③ 14 ④ 15 ⑤ 16

- e. What is the result of the printf at line **(C)**
- ① 6 ② 7 ③ 8 ④ 9 ⑤ 10

- f. Suppose maze[5][5] = 1, then
What point is not in the path
- ① (1, 2) ② (1, 3) ③ (2, 3) ④ (5, 4) ⑤ (6, 5)

- g. Suppose maze[5][5] = 1, then

What is the value of position.dir when nextRow is 1 and nextCol is 2 at **(A)**

- ① 0 ② 1 ③ 2 ④ 3 ⑤ 4

- h. Suppose maze[5][5] = 1, then

What is the value of position.dir when nextRow is 3 and nextCol is 5 at **(A)**

- ① 0 ② 1 ③ 2 ④ 3 ⑤ 4

- i. Suppose maze[5][5] = 1, then

What is the result of the printf at line **(B)**

- ① 12 ② 13 ③ 14 ④ 15 ⑤ 16

- j. Suppose maze[5][5] = 1, then

What is the result of the printf at line **(C)**

- ① 6 ② 7 ③ 8 ④ 9 ⑤ 10