111-1 Data Structure Midterm Exam

1.

(A) new_node -> value = new_value;
new_node -> next = *top;
*top = new_node

(B) value = (*top) -> value; //or value = *deleting_node -> value
*top = (*top) -> next; //or *top = *deleting_node -> next

2.

(a) Q(2,3)=0 since 2<3，Q(14,3) = Q(11,3)+1 = [Q(8,3)+1]+1 = …. = Q(2,3)+4 = 0+4 = 4

(b) 837

(c) Each time b is subtracted from a, the values of Q is increase by 1. Hence Q(a, b) find the quotient when a is divided by b.

3.

(a)newnode->rlink = node->rlink;

(b)node->rlink->llink = newnode;

(c)deleted->llink->rlink = deleted->rlink;

(d)deleted->rlink->llink = deleted->llink;

4.

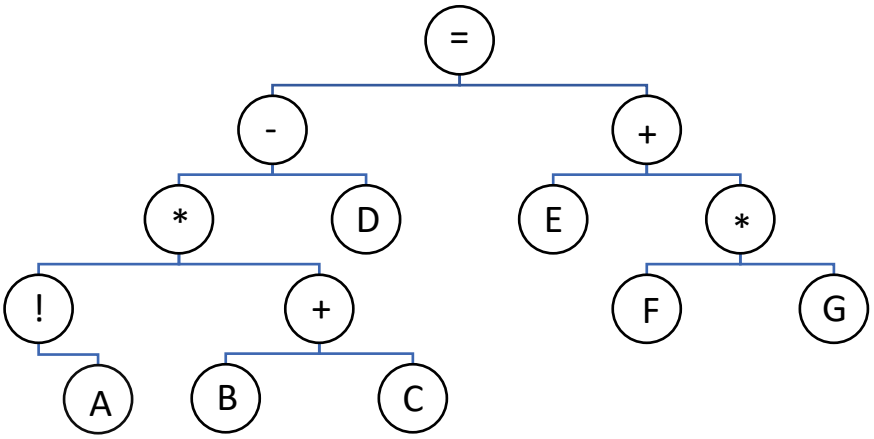
-4

5.

設兩個指標 A 和 B，A 指標尋訪時一次往後一個節點，B 指標尋訪時一次往後兩個節點。因此當 B 指標走到最後一個節點/指向 null 時，A 指標正好尋訪到第 $\frac{n}{2}$ 個節點。

6.

(a)



(b)

Token	Stack [0] [1] [2]	Output
!	!	
A	!	A
*	*	A!
(	* (	A!
B	* (	A! B
+	* (+	A! B
C	* (+	A! BC
)	*	A! BC+*
-	-	A! BC+*
D	-	A! BC+* D
=	=	A! BC+* D-
E	=	A! BC+* D- E
+	= +	A! BC+* D- E
F	= +	A! BC+* D- EF
*	= + *	A! BC+* D- EF
G	= + *	A! BC+* D- EFG
Eos		A! BC+* D- EFG*+=

7. (A) FRONT = 2, REAR = 5, QUEUE: __, A, C, D, F, __

(B) FRONT = 4, REAR = 5, QUEUE: __, __, __, D, F, __

(C) FRONT = 4, REAR = 2, QUEUE: L, M, __, D, F, K

(D) FRONT = 6, REAR = 2, QUEUE: L, M, __, __, __, K

(E) FRONT = 6, REAR = 3, QUEUE: L, M, R, __, __, K

(F) FRONT = 2, REAR = 3, QUEUE: __, M, R, __, __, __

(G) FRONT = 2, REAR = 4, QUEUE: __, M, R, S, __, __

(H) FRONT = 4, REAR = 4, QUEUE: __, __, __, S, __, __

(I) FRONT = NULL, REAR = NULL, QUEUE: __, __, __, __, __, __

在刪除時會檢查，如果 FRONT==REAR，將 FRONT, REAR 設為 NULL

(J) Since FRONT == NULL, no deletion can take place. That is, underflow has occurred.

8.

```
Identical (ptrA, ptrB)
{
      result = False;
      if (ptrA==nil && ptrB==nil) then result = True;
      else if (ptrA!=nil && ptrB!=nil) then {
            if (ptrA->Data==ptrB->Data) then result = identical (ptrA->link, ptrB->link);
      }
      return result;
}
```

9.

	Data	**Link**
23	56	32
24	8	29
25	12	34
26	5	NULL
27	76	25
28	123	31

29	9	33
30	67	NULL
31	23	26
32	567	30
33	78	28
34	123	24

AVAIL: 27 Linked queue Q: FRONT: 23, REAR: 30

10.

(1) crystal (N-1) + N*N or N*(N+1)*(2*N+1)/6

(2) 91

11.

(1) True

(2) True

(3) True

12.

(1) 假設有一個 Deque 為 3, 1, 2, 5, 4，在 Greedy 的方法之下得到的序列是<4, 3, 5, 1, 2>，sum=4-3+5-1+2=7。

然而 Optimal 的序列應該是<3 ,1 ,4 ,2 ,5>，sum=3-1+4-2+5=9

(2) 假設有一個 Deque 為$a_i, a_{i+1}, \dots, a_{j-1}, a_i$，前兩項的取法共有四種，分別是$a_i - a_{i+1}$、$a_i - a_j$、$a_j - a_i$、$a_j - a_{j-1}$。

設 r[i, j]會得到對應之最佳解。

$$\begin{cases} 0, & if\ i = j+1 \\ a_i, & if\ i = j \\ \max\{a_i - a_{i+1} + r[i+2, j],\ a_i - a_j + r[i+1, j-1], \\ a_j - a_i + r[i+1, j-1],\ a_j - a_{j-1} + r[i, j-2]\}, & if\ i < j \end{cases}$$

用(1)的例子 3, 1, 2, 5, 4

r[i, j]	0	1	2	3	4	5
1	0	3	2	4	5	9
2		0	1	1	6	6
3			0	2	3	7
4				0	5	1
5					0	4
6						0