2. C Program to Generate All the Set Partitions of n Numbers Beginning from 1 and so on

This algorithm partitions an integer into numbers which sum up to form the original number. It generates partitions of a set of numbers for a given range.

**Sample Input**

Enter a number N to generate all set partition from 1 to N: 5  
Integer partition for 1 is:  
1

Integer partition for 2 is:  
2  
11

Integer partition for 3 is:  
3  
12  
111

Integer partition for 4 is:  
4  
13  
112  
1111  
22

Integer partition for 5 is:  
5  
14  
113  
1112  
11111  
122  
23

#include <stdio.h>

#include <stdlib.h>

typedef struct {

int first;

int n;

int level;

} Call;

void print(int n, int \* a) {

int i ;

for (i = 0; i <= n; i++) {

printf("%d", a[i]);

}

printf("\n");

}

void integerPartition(int n, int \* a){

int first;

int i;

int top = 0;

int level = 0;

Call \* stack = (Call \* ) malloc (sizeof(Call) \* 1000);

stack[0].first = -1;

stack[0].n = n;

stack[0].level = level;

while (top >= 0){

first = stack[top].first;

n = stack[top].n;

level = stack[top].level;

if (n >= 1) {

if (first == - 1) {

a[level] = n;

print(level, a);

first = (level == 0) ? 1 : a[level-1];

i = first;

} else {

i = first;

i++;

}

if (i <= n / 2) {

a[level] = i;

stack[top].first = i;

top++;

stack[top].first = -1;

stack[top].n = n - i;

stack[top].level = level + 1;

} else {

top--;

}

} else {

top --;

}

}

}

int main(){

int N = 1;

int \* a = (int \* ) malloc(sizeof(int) \* N);

int i;

printf("\nEnter a number N to generate all set partition from 1 to N: ");

scanf("%d", &N);

for ( i = 1; i <= N; i++)

{

printf("\nInteger partition for %d is: \n", i);

integerPartition (i, a);

}

return(0);

}

Output:

