CS19101 Programming and Data Structures
2D arrays, Array of structures, Number systems

General instruction to be followed strictly

1. Do not use any global variable unless you are explicitly instructed so.
2. Use proper indentation in your code and comment.
3. Name your file as `<roll_no>_<assignment_no>`. For example, if your roll number is 14CS10001 and you are submitting assignment 3, then name your file as `14CS10001_3.c` or `14CS10001_3.cpp` as applicable.
4. Write your name, roll number, and assignment number at the beginning of your program.
5. Make your program as efficient as possible.

Part-I

Submit one (single) C program.

Write a C program to perform the following tasks.

1. Define a structure *num* which has 2 arrays Bin and Oct. The objective of the 2 arrays is to store the binary representation and octal representation, respectively, of a decimal number that lies between -500 and 500.
   Bin[0] contains the least significant bit of the binary representation. Negative numbers will be represented as 1's complement in binary representation.
   Similarly, Oct[0] contains the least significant bit of the octal representation. Negative numbers will be represented as 8's complement in the octal representation.
2. Define a 2D array A[][] of type *num*, where the number of rows is at most 20 and the number of columns is at most 20.
3. Take as input two positive integers $n, m \leqslant 20$.
4. For $0 \leqslant i < n, 0 \leqslant j < m$, take as input a decimal integer a_{ij} and store in A[i][j] a structure of type *num* that stores the binary and octal representations of a_{ij}.
5. Define a 2D array B[][] of type bool, where the number of rows is at most 20 and the number of columns is at most 20.
6. Set B[i][j] to 1 if in A[i][j] both the conditions are true:
   - ▷ (i) the i^{th} element in the binary representation of a_{ij} is 0, (If there is no i^{th} element then consider the value to be 0).
   - ▷ (ii) the j^{th} element in the octal representation is at most 4 (If there is no j^{th} element in the octal representation then consider the value to be 0).

In all other cases, set B[i][j] to 0.

7. Print B as a 2D array. In other word, if there are n rows and m columns that are filled in B, then the output should be printed in n rows and m columns.

You can write your own functions wherever necessary, but proper commenting is required to explain the purpose of the function.

Part-II

Sample Output

```
Enter positive integer n less than equal to 20: 2
Enter positive integer m less than equal to 20: 2
Enter an integer between -500 and 500 for A[0][0]: 3
Enter an integer between -500 and 500 for A[0][1]: 9
Enter an integer between -500 and 500 for A[1][0]: 1
Enter an integer between -500 and 500 for A[1][1]: -5

The matrix B is as follows:
0 0
1 0
```

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