2020/2021 SOUTHERN CALIFORNIA REGIONAL
INTERNATIONAL COLLEGIATE PROGRAMMING CONTEST

Problem 9
Redundant Binary Notation

Redundant binary notation is similar to binary notation, except instead of allowing only 0s and 1s for each digit, we allow any integer digit in the range $[0, t]$, where t is some specified upper bound. For example, if $t = 2$, the digit 2 is permitted, and we may write the decimal number 4 as 100, 20, or 12. If $t = 1$, every number has precisely one representation, which is its typical binary representation. In general, if a number is written as $d_l d_{l-1} \dots d_1 d_0$ in redundant binary notation, the equivalent decimal number is $d_l \cdot 2^l + d_{l-1} \cdot 2^{l-1} + \cdots + d_1 \cdot 2^1 + d_0 \cdot 2^0$.

Redundant binary notation can allow carryless arithmetic, and thus has applications in hardware design and even in the design of worst-case data structures. For example, consider insertion into a standard binomial heap. This operation takes $O(\log n)$ worst-case time but $O(1)$ amortized time. This is because the binary number representing the total number of elements in the heap can be incremented in $O(\log n)$ worst-case time and $O(1)$ amortized time. By using a redundant binary representation of the individual binomial trees in a binomial heap, it is possible to improve the worst-case insertion time of binomial heaps to $O(1)$.

However, none of that information is relevant to this question. In this question, your task is simple. Given a decimal number N and the digit upper bound t, you are to count the number of possible representations N has in redundant binary notation with each digit in range $[0, t]$ with no leading zeros.

Input consists of a single line with two decimal integers N ($0 \le N \le 10^{16}$) and t ($1 \le t \le 100$), separated by whitespace.

Output in decimal the number of representations the decimal number N has in redundant binary notation with each digit in range $[0, t]$ with no leading zeros. Since the number of representations may be very large, output the answer modulo the large prime 998 244 353.

Sample Input 1

```
4 2
```

Output for Sample Input 1

```
3
```

Sample Input 2

```
6 3
```

Output for Sample Input 2

```
4
```

Sample Input 3

```
479 1
```

Output for Sample Input 3

```
1
```

Sample Input 4

```
3846927384799 62
```

Output for Sample Input 4

```
690163857
```

Sample Input 5

```
549755813887 2
```

Output for Sample Input 5

```
1
```