Question 5: What do I say when I am decoded? (3 marks)

You are tasked with designing a variable-length decoding algorithm for a given set of bit strings.

A variable-length code is an encoding mechanism where each symbol can be represented by a number of bits that varies from symbol to symbol.

For example, 'a' could be represented by '01', 'b' by '01', 'c' by '10', etc. This kind of encoding is useful in situations where some symbols appear more frequently than others, and hence, it makes sense to assign fewer bits to more frequent symbols.

Your task is to write a function

decode(encoded: str, codebook: Dict[str, str]) -> str

which takes an encoded string and a codebook, and returns the original string. The function should return an error if the encoded string is not a valid encoding according to the codebook.

Let's consider this codebook:

```
{'a': '00',
 'b': '01',
 'c': '10',
 'd': '1100',
 'e': '1101',
 'f': '1110',
 'g': '111100',
 'h': '111101',
 'i': '111110',
 'j': '1111110000',
 'k': '1111110001',
 'l': '1111110010',
 'm': '1111110011',
 'n': '1111110100',
 'o': '1111110101',
 'p': '1111110110',
 'q': '1111110111',
 'r': '1111111000',
 's': '1111111001',
 't': '1111111010',
 'u': '1111111011',
 'v': '1111111100',
 'w': '1111111101',
```

```
 'x': '1111111110',
 'y': '1111111111',
 'z': '11111111110000',
 ' ': '11111111110001'}
```

Example
decode('0110', codebook) should return 'bc'.

What is the decoded phrase for this string?

“11111011111111110001111111001011111101011111111100110111111111111000100111111010
01111001101111111001011111010010111111000111111111110001101111110101110011011111
11111100011011110100111111001011111100101101111111010011110011011111111111000010
11101100011111110111111111001110111111111111000111111011111110101111111111000111 1
11011111110011111111111000111101111111011111111010011111111110001001111110100110
01111111111000111011111111111010111110111111101011111011111101001111001111111110
00100111111010011001111111111000111111011111111110001110011111011111110011111110
01011111011111100011101111111111000111111110101111011101111111111110001111111110
11111110101111111100011001111111111000111111111110001111111111100011111111010111
10100111111101011111111110001001111111011011111101101101001111111000111111100111
11111111000111111011111101001111111111000111111110101111011101111111111100011111
11011011110111111110000011111110011101”

P.S. Use your best judgement to get the proper final answer - the answer should make sense and be readable! It’s not a 3-mark question for no reason :D