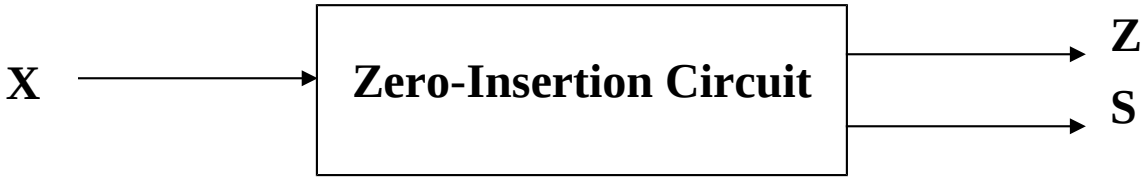
Homework 8

The sequence 01111110 is a flag used in a message communications network that represents the beginning of a message. This flag must be unique. As a consequence, at most five 1's in sequence may appear anywhere else in the message. Since this is unrealistic for normal message content, a trick called zero-insertion is used. The normal message, which can contain strings of 1's longer than 5, enters input X of a sequential zero-insertion circuit given below:



The circuit has two outputs Z and S. When a sixth 1 in sequence appears on X, a 0 is inserted into the stream of outputs appearing on Z and the output S = 1 indicating that a zero-insertion has happened. Zero-insertion is illustrated by the following example sequences:

```
Message sequence on X:          01111110011111111100001011110101
Output sequence on Z:           01111100011111011000010111101010
Zero-insertion indicator on S:  00000010000000100000000000000000
```

Task: Design the zero-insertion circuit above following the 9-step design procedure given in Lecture 10 using SR Flip-Flops and logic gates.

IMPORTANT: Show and explain all the steps!