

COMP102 Fall 2006
Assignment 2 – Part 1/2
Due: Thursday, October 5th, 2006, 8:35 a.m.

Please show all your work. No grade will be given for providing the final answer only. However, partial grade will be given for incomplete answers. Unacknowledged use of resources is prohibited. The answers given must be your own.

1. Lempel-Ziv Encoding [20]

[10] (a) The following message was compressed using the Lempel-Ziv encoding seen in class. Decode this message.

0100101(4, 3, 0)(8, 7, 1)(17, 9, 1)(8, 6, 1)

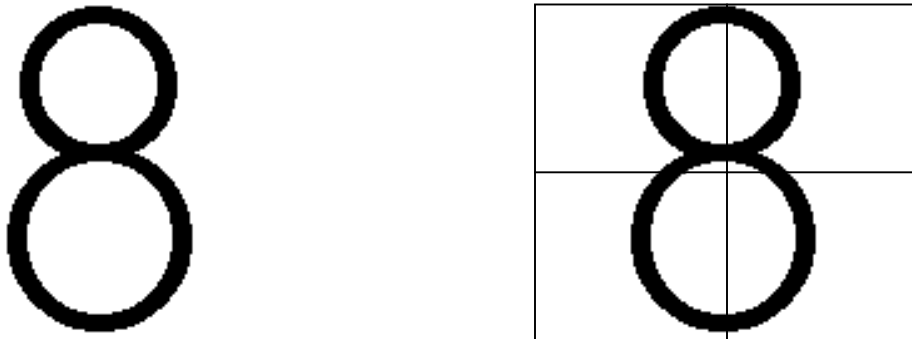
[10] (b) Here is a part of a message that was compressed using the Lempel-Ziv encoding. Based on the information given, how long was the original message?

*#\$(_, 3, #)(_, 6, \$)

[Here “_” denotes an unknown number]

2. Analog to Digital Conversion [20]

Suppose you were given the following hand-drawn image of the number 8 on the left:



Your job is to convert this “analog” picture into a digital picture consisting of pixels. To do so, you will lay a square grid (like on the right) over the picture and then colour those pixels black that intersect any part of your drawing. Your digital image should be square (the image resolution should have as many height pixels as width pixels) and its width and height should be a power of 2 (2, 4, 8, 16, ..., or 2^n for some n). What is the minimal resolution at which your digital image will capture exactly two of the holes in the “8”, but not more? [10] What different criterion could you use for digitizing your image that would capture both of the holes using a smaller image resolution? [5] Show that your criterion produces a smaller digital image of the drawing of the “8”. [5] You can change the drawing of your “8” so that your answers work out. A digital hole is a region of white pixels surrounded by black pixels that are touching diagonally, vertically or horizontally.