

THE UNIVERSITY OF AUCKLAND

Department of Computer Science COMPSCI 314 S1 C 2004 : Assignment 3

Due Tuesday April 27 2004, 4.00 pm.

You must show working – no visible working may mean no marks.

Submit the answer on A4 paper to the correct assignment hand-in box at the Resource Centre.

- Q1.** (i) Generate the codeword $c(x)$ for the message $i(x)$ below, forming the CRC using the generator polynomial $g(x) = x^4 + 1$.

$$i(x) = 1001010110100110 \quad [3 \text{ marks}]$$

- (ii) Show that the received message $v(x) = c(x)$ gives a zero syndrome. [2 marks]

- (iii) Show that the received message $v(x) = c(x) + e(x)$, where $e(x) = x^7$ gives a detectable error. [2 marks]

- (iv) Show that the check bits added by the division are the same as those generated by taking the *longitudinal* parity of the message, considered as a sequence of 4-bit “nibbles”. $i(x) = 1001 \ 0101 \ 1010 \ 0110$ [2 marks]

- (v) (Bonus) Explain why parts (i) and (iv) give the same check bits. {2 marks}

Question total [9 marks (+2)]

- Q2.** (i) Generate the Hamming codeword $c(x)$ for the information octet $i(x)=01001011$.

(This question assumes the least-significant bit to the left, with bits numbered from 1). [2 marks]

- (ii) Show that the generated codeword decodes indicating no error [2 marks]

- (iii) Show that the Hamming decode will correctly show an error in bit 7 of the codeword. [2 marks]

Question total [6 marks]

- Q3.** *The answers to this question should be presented in tables similar to those in the handouts. Assume that the dictionary is initialised to the ‘ASCII’ codes 0–255, to cover all possible byte values; you start adding words at index 256. You may refer to one of these initial entries by its letter rather than its numeric index, such position A rather than $41_{16} = 65_{10}$.*

- (i) Apply LZW compression to the string PARAPARAUMU [5 marks]

- (ii) Recover the original text by decompressing the output from part (i) [5 marks]

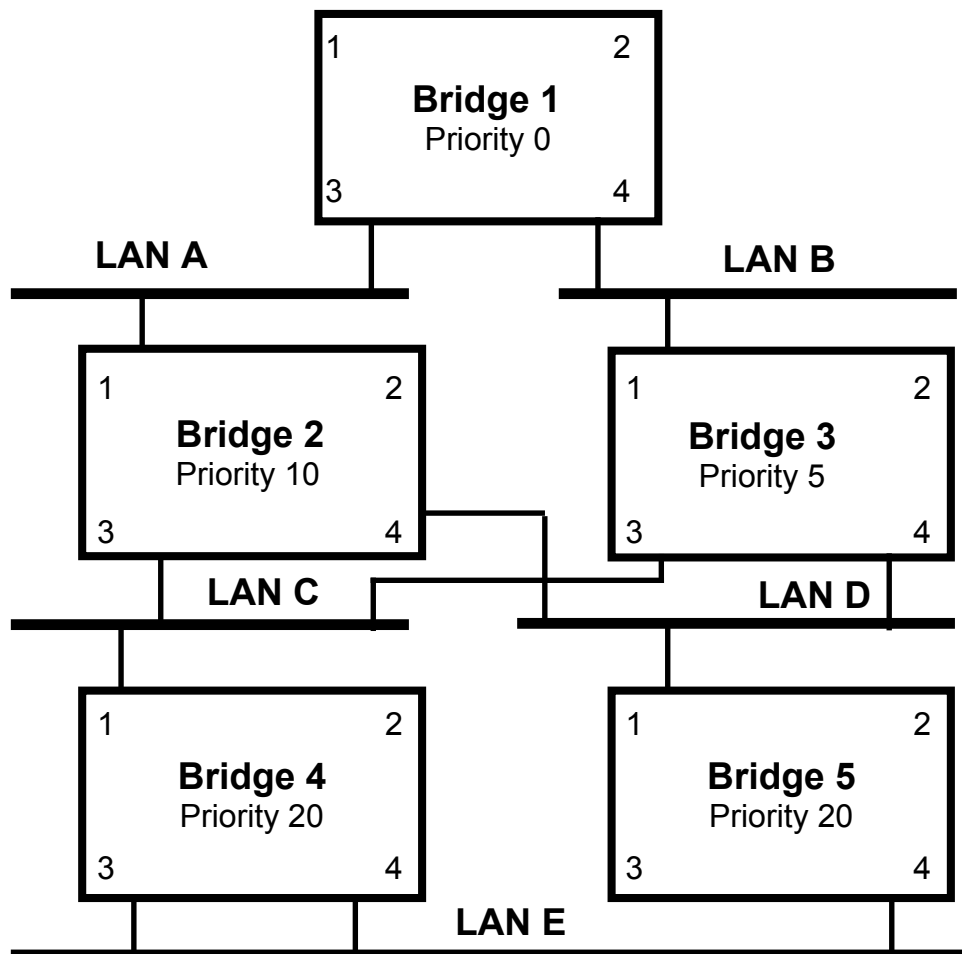
Question total [10 marks]

Q4. Obtain the spanning tree for the network shown below.

- The notes had the BridgeID as only the MAC address, but here we use the full form with the Bridge ID being firstly a “bridge priority” (most significant) and then the Bridge Number (least significant).

Bridges are therefore compared *first* on priority and *second* on Bridge number.

- All ports have the same cost, and each is identified by its “corner” of the bridge, such as Bridge 3, port 2 at the top-right corner might be written as port[3.2] (and is not used here).



Question total [5 marks]

Assignment TOTAL = 30 marks (+2)