University of York

Embedded Systems Design & Implementation

Open Individual Assessment

Open Assessment 1

Examination number:

Y3606797

Contents

1 Part 1 - Theory

1.1 Question 1

We can determine the rate X of actor H by producing a set of simultaneous equations from Table 1 and the provided Synchronous Dataflow model.

The topology matrix for the SDF model is as follows:

$$\Gamma = \begin{bmatrix} 2 & 0 & 0 & 0 & -2 & 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 & -2 & 0 & 0 & 0 & 0 \\ 0 & 0 & 2 & 0 & -2 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 2 & -2 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 2 & -6 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 3 & -2 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & X & -3 \\ 0 & 0 & 0 & 0 & 0 & 0 & -1 & 0 & 1 \end{bmatrix}$$

This gives us the following simultaneous equations:

$$\begin{array}{lll} 2A - 2E = 0 & 2B - 2E = 0 & 2C - 2E = 0 \\ 2D - 2E = 0 & 2E - 6F = 0 & F - I = 0 \\ 3G - 2H = 0 & XH - 3I = 0 & I - G = 0 \end{array}$$

Using these equations I determined that $X = 2$. Similarly, I determined the firing frequencies of the remaining actors, seen in the vector q:

$$q = \begin{matrix} A \\ B \\ C \\ D \\ E \\ F \\ G \\ H \\ I \end{matrix} \begin{pmatrix} 6 \\ 6 \\ 6 \\ 6 \\ 6 \\ 2 \\ 2 \\ 3 \\ 2 \end{pmatrix}$$

1.2 Question 2

Using the firing frequencies determined in Question 1, I was able to identify the following PASS schedule:

a.fire(3); b.fire(3); c.fire(3); d.fire(3); e.fire(3); f.fire(1); a.fire(3); b.fire(3); c.fire(3); d.fire(3); e.fire(3); f.fire(1); g.fire(2); h.fire(3); i.fire(2);

The maximum required FIFO buffer size is 6 as required and the number of firings of the actors match up with their frequencies in the vector q (Question 1).

1.3 Question 3

For my chosen PASS schedule the number of tokens that must be initially stored in the buffer of the feedback channel c9 is 2.

2 Part 2 - WSN MAC layer protocol

2.1 Question 1

2.2 Question 2

3 Part 3 - Embedded platform modelling

3.1 Question 1