

TIE-50406 DSP Implementations

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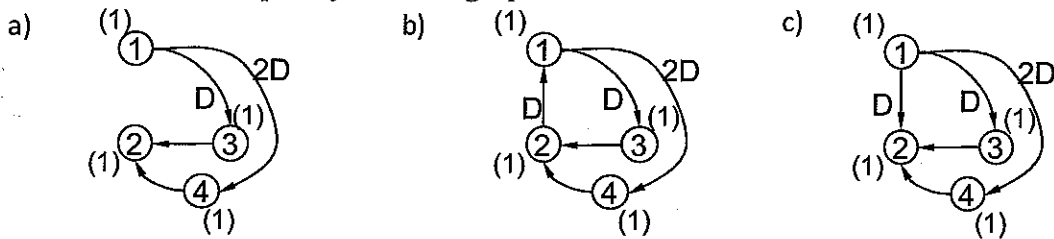
Exam Jan. 21, 2016

Calculators and dictionaries are allowed

1. Explain shortly:

- a) recursive DFG
- b) L-slow delay
- c) truncation of magnitude
- d) SDFG
- e) biased exponent
- f) precedence constraint in data flow graphs

2. Define the iteration bound of the following data flow graphs. What is the maximum clock frequency for each graph?



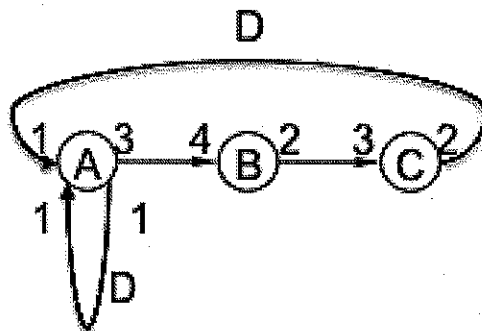
3. A linear systems is described with the following equations:

$$w(n) = x(n) + a_1w(n-1) + a_2w(n-3)$$

$$z(n) = b_1w(n) + b_2w(n-2).$$

Assume that multiplication takes 4u.t. and addition 1u.t.. Draw the corresponding signal flow graph. What is the critical path? What is the iteration bound? What is maximum clock period? If you apply retiming, what is the minimum clock period when a) assuming that arithmetic unit cannot be pipelined and b) assuming that arithmetic units can be pipelined?

4. a) Draw a single rate data flow graph corresponding to the multi rate data flow graph below. B) Draw the corresponding signal flow graph.



5. Folding/Unfolding. What is done in folding? What is done in unfolding? Why folding is used? Why folding would be used? Let us assume a recursive data flow graph G. Which one will produce the highest performance: direct mapping, unfolding, or folding? What happens to latency after folding compared to direct mapping?