

Unit 4 - Week 2

Course outline

How to access the portal

Pre-Requisite Assignment

Week 1

Week 2

Basic FIR filter

Serial FIR filter architectures

Simple programmable architecture

Block diagrams and SFGs

Dataflow Graphs

Iteration period

FIR filter iteration period

IIR filter iteration period

Computation Model

Quiz : Assignment 2

Week 2 Feedback : Mapping Signal Processing Algorithms to Architectures

Week 3

Week 4

Week 5

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Week 12

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Assignment 2

The due date for submitting this assignment has passed. As per our records you have not submitted this assignment.

Due on 2019-08-21, 23:59 IST.

- 1) Which of the following hardware resource element types will be needed for implementing a serial FIR filter that uses resource sharing? 2 points
- Divider
 - MUX
 - Registers
 - Barrel-shifter
 - Counter
 - Multiplier
 - Dynamic RAM
 - Transmission gate XOR

No, the answer is incorrect. Score: 0

Feedback:

Solution: Dividers, barrel-shifters, dynamic RAM and XOR gates are not required for an FIR filter. An XOR gate may find use inside some other module used in a filter, but the gate by itself is not a necessity. However, a counter and MUX will be used for appropriately directing the inputs to the shared resource, multipliers are required for the coefficient multiplication, and registers are required to store the values

Accepted Answers:

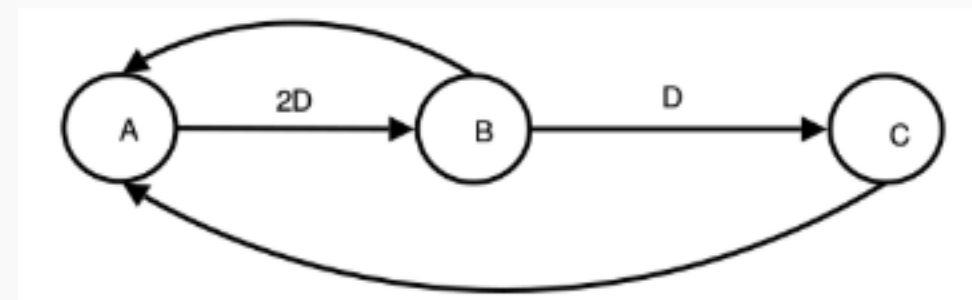
MUX

Registers

Counter

Multiplier

For the diagram shown, assume the propagation delay (execution time) of the nodes are $d_A = 10$, $d_B = 10$ and $d_C = 40$ (ignore units)



Based on the above graph answer the following questions 2 to 6

For each of the following firing schedules, indicate whether they are valid or invalid

- 2) $A_0 B_0 C_0$ 1 point

- valid
- Invalid

No, the answer is incorrect. Score: 0

Feedback:

Solution : A cannot start executing until it has sufficient input tokens - initially it is 0, so it has no initial conditions to start

Accepted Answers:

Invalid

- 3) $B_0 B_1 C_0 C_1 A_0 A_1$ 1 point

- valid
- Invalid

No, the answer is incorrect. Score: 0

Feedback:

Solution: This is a valid sequence of firing for the dataflow graph

Accepted Answers:

valid

- 4) $C_0 C_1 B_0 B_1 A_0 A_1$ 1 point

- valid
- invalid

No, the answer is incorrect. Score: 0

Feedback:

Solution: C_0 is OK as C has one initial token, but C_1 cannot fire until B has fired at least once to give a token on the B - C edge. In other words, C does not have sufficient input data for two firings to start with

Accepted Answers:

invalid

For the firing sequence $B_0 B_1 C_0 C_1 A_0 A_1$

- 5) how much is the latency:

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Numeric) 110

1 point

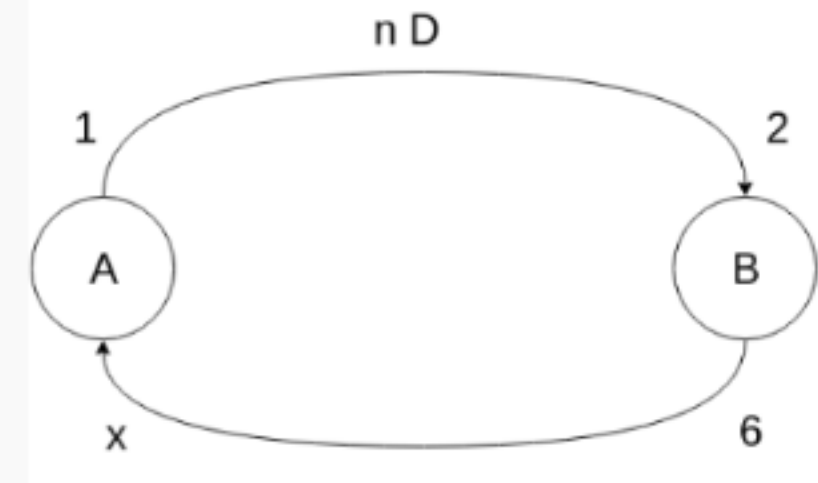
- 6) how much is the average initiation interval:

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Numeric) 30

1 point

For the multi-rate dataflow graph shown in the figure. Based on this answer the following questions 7 to 9



- 7) What should be the value of x so that the dataflow graph can execute in a valid manner?

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Numeric) 3

1 point

- 8) What should be the minimum value of n for valid firing of the graph?

No, the answer is incorrect. Score: 0

Accepted Answers: (Type: Numeric) 2

1 point

- 9) If $x = 5$ and $n = 2$, the buffers in the graph will eventually:

- Overflow
- Underflow

No, the answer is incorrect. Score: 0

Feedback:

Solution: Each time B fires it produces 6 tokens, but A consumes 5 tokens and produces only 1. So it will not produce enough tokens for second firing of B, leading to underflow on the A - B edge.

Accepted Answers:

Underflow

1 point