Datapath Functional Units

Contents

- Comparator

- Funnel Shifter

- Multi Input Adder
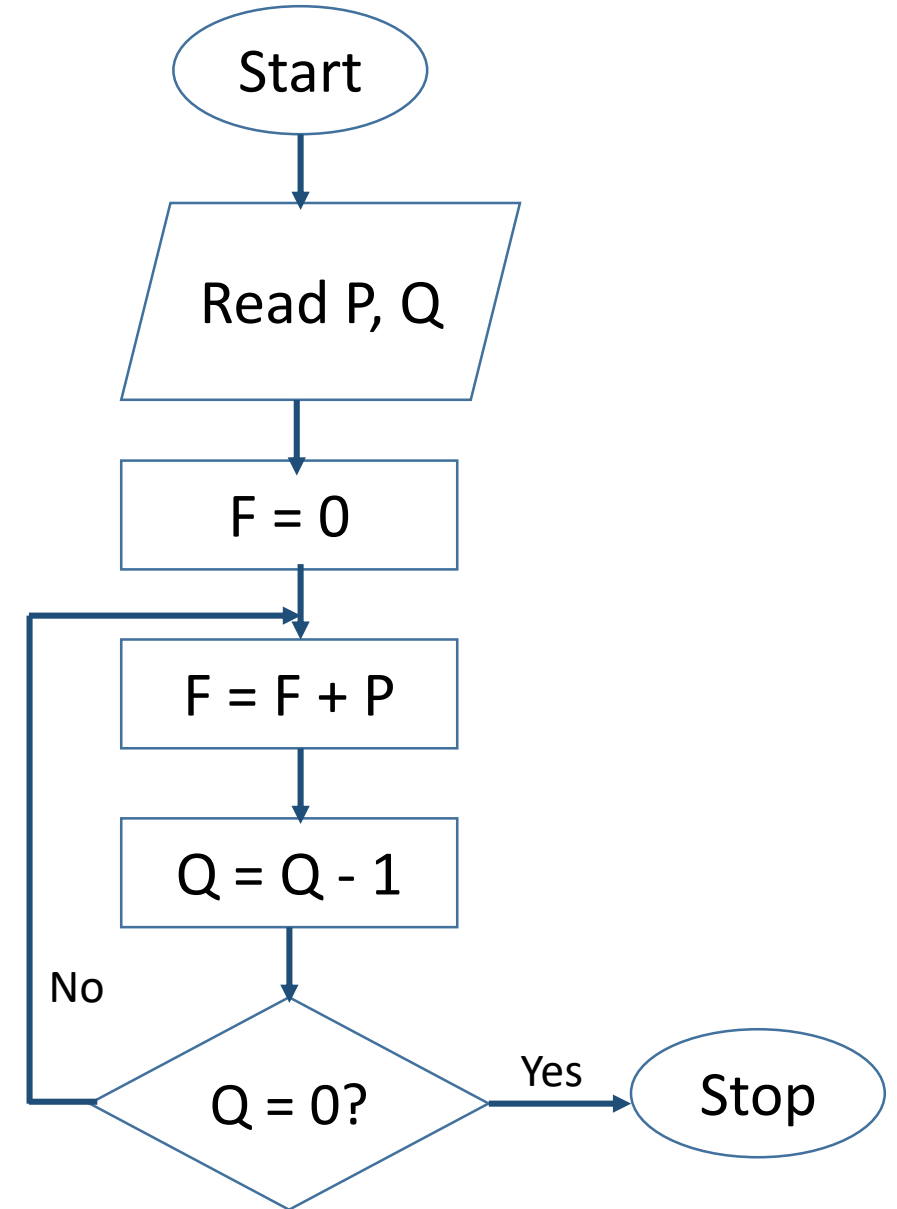
- Multiplier

- Divider

Introduction

- Data path
  - Consists of functional units where all computations are carried out
    - Ex: Registers, multiplexers, bus, adders, multipliers, counter
- Control path
  - Consists of FSM and provide control signals to the data path in proper sequence
  - With the help of control signals various operations are carried out by the data path
  - Also takes inputs from the data path regarding status information

Introduction

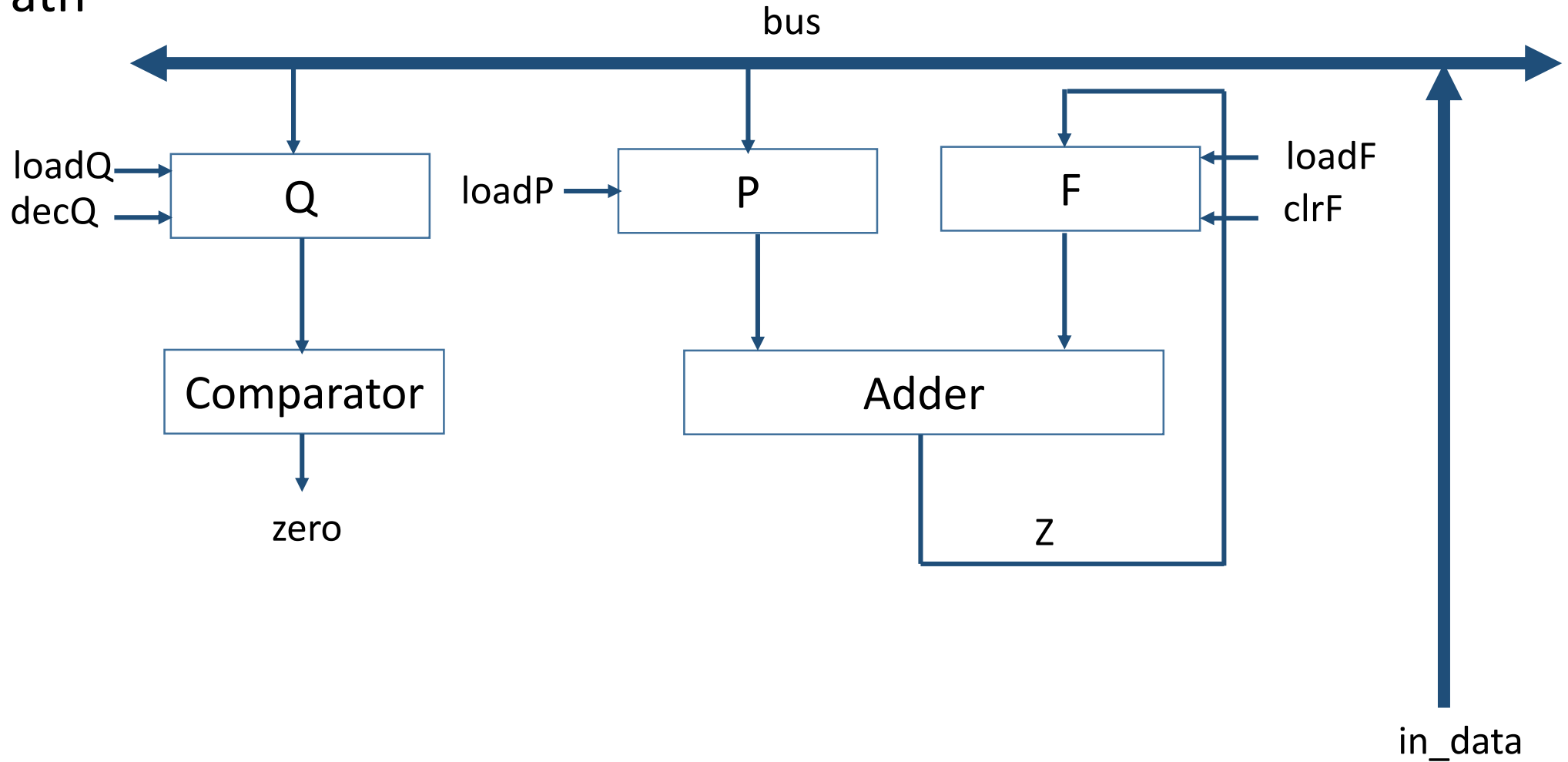- Illustrate data and control path

  - P = Q + R

  - S = P - R

Multiplication by repeated addition

- Illustrate P * Q by repeated addition

- Assumption, Q is not zero

- Identify the functional blocks

- Design the FSM to implement the
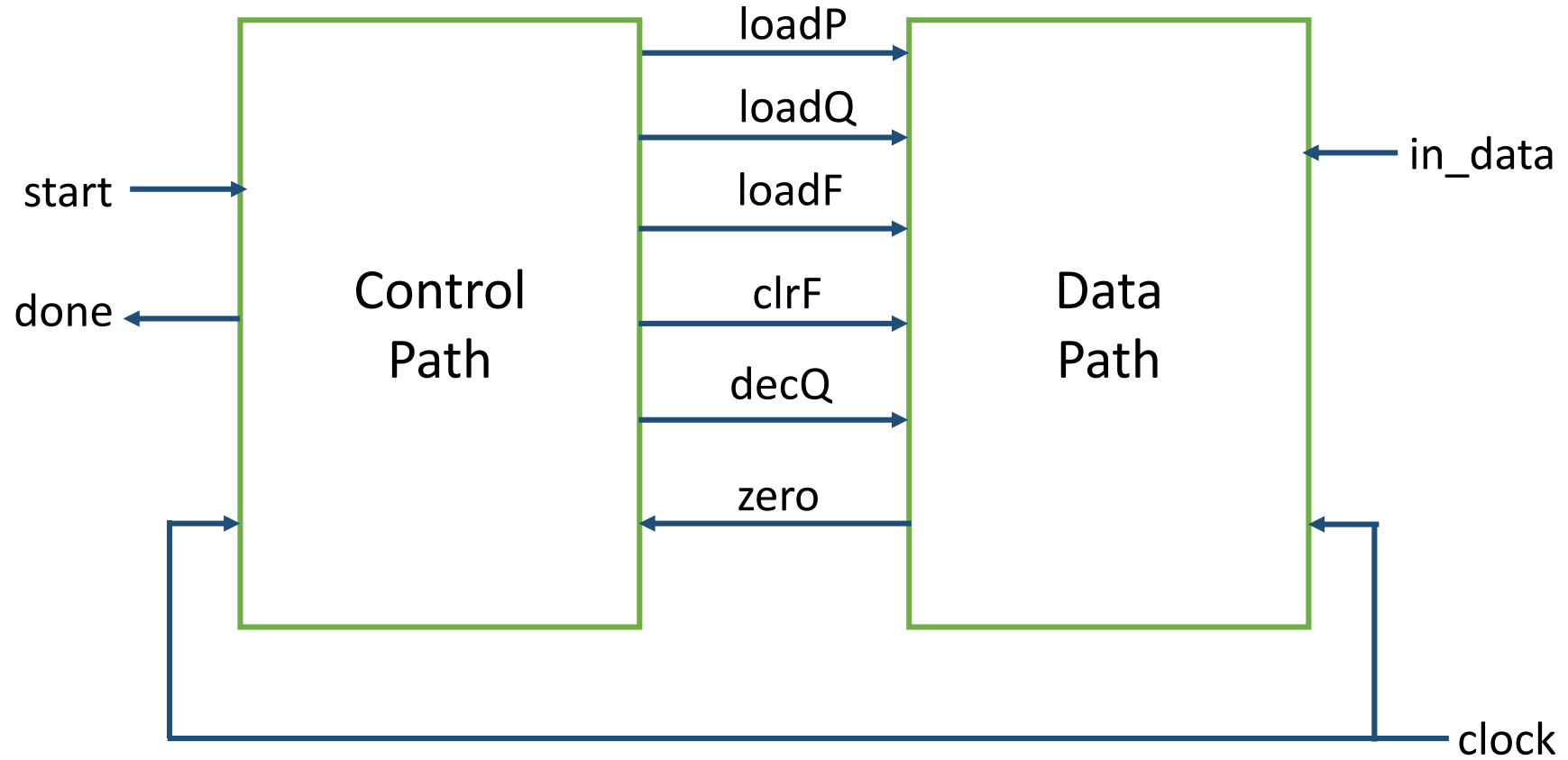 algorithm with the help of data path

5

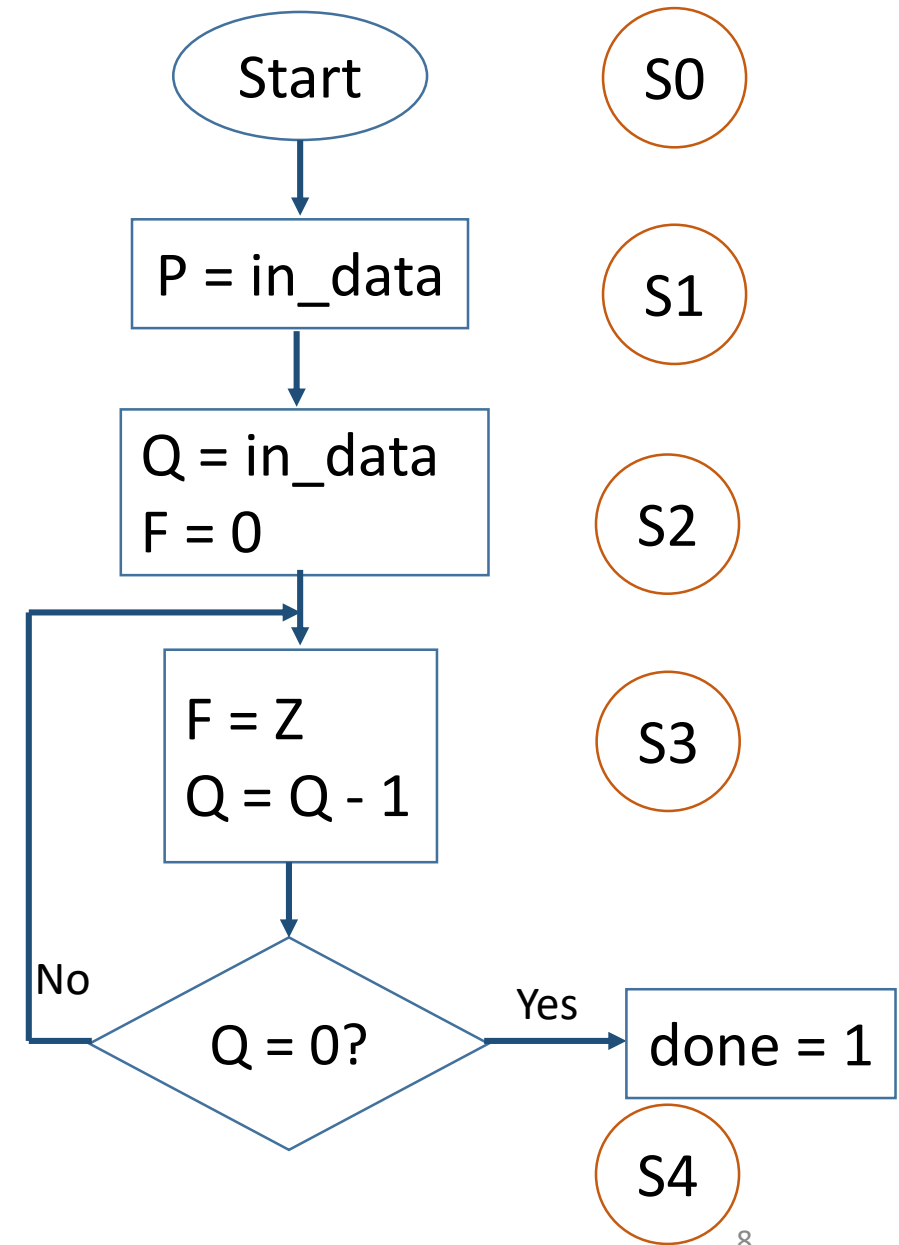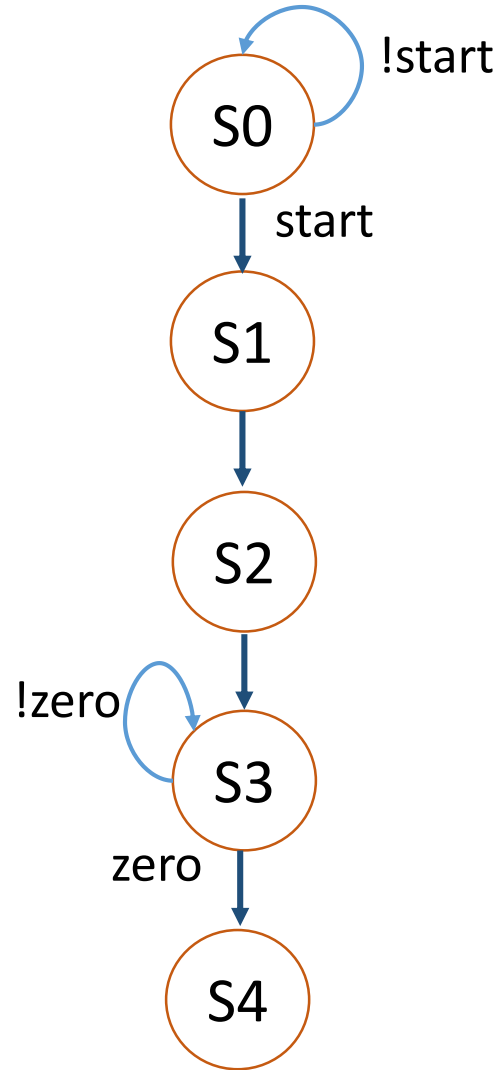# Multiplication by repeated addition

- Data Path

Multiplication by repeated addition

- Block Diagram

Multiplication by repeated addition

- Control Path

State diagram: S0 with self-loop !start, transition on start to S1, S1 → S2 → S3 (with self-loop !zero), transition on zero to S4.

Flowchart: Start → P = in_data (S1) → Q = in_data, F = 0 (S2) → F = Z, Q = Q - 1 (S3) → Q = 0? → Yes → done = 1 (S4); No loops back.

Multiplication by repeated addition

- Write HDLs and simulate