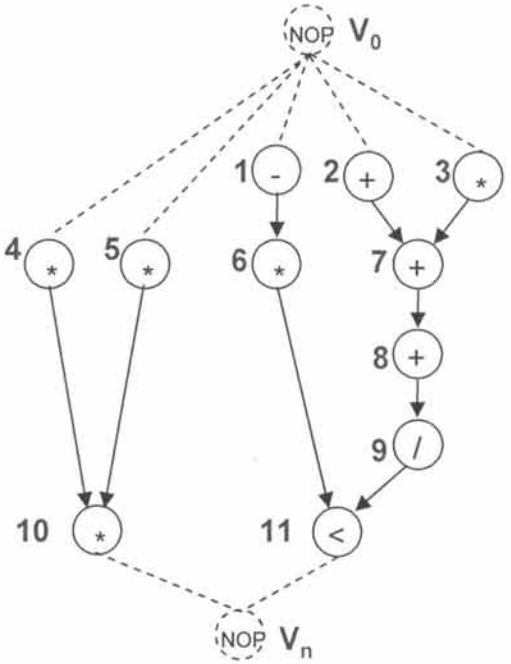
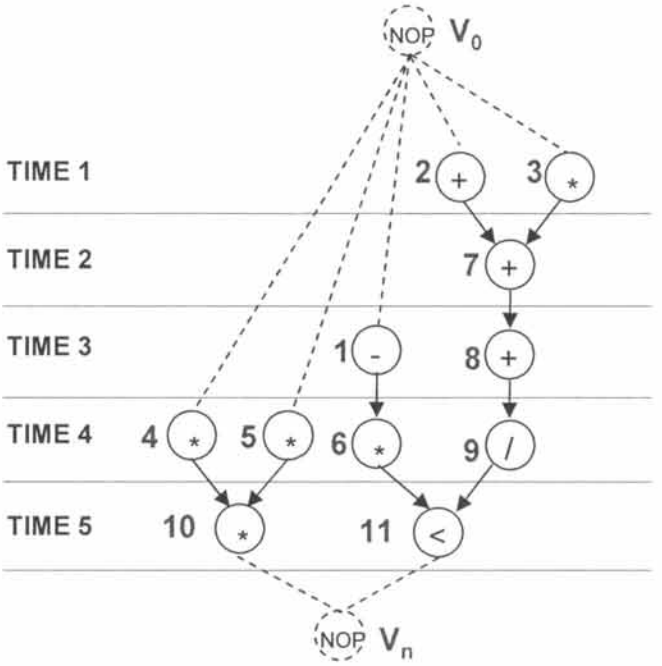
#1 schedule the following CDFG assuming latency = 5

* all operations have 1 unit delay





Node	Time
1	3
2	1
3	1
4	4
5	4
6	4
7	2
8	3
9	4
10	5
11	5

① compute the latest start times by using ALAP

$a_1 = 1$ mult
$a_2 = 1$ ALU

i = 1

	mult	ALU
(a) compute candidate operations	$U = \{v_4, v_5, v_3\}$	$U = \{v_1, v_2\}$
(b) compute slack	$v_4 = 4-1 = 3$ $v_5 = 4-1 = 3$ $v_3 = 1-1 = 0$	$v_1 = 3-1 = 2$ $v_2 = 1-1 = 0$
(c) schedule ops with 0 slack	schedule v_3	schedule v_2
(d) schudule candidates requiring no additional resources	n/a	n/a

i = 2

(a)	$U = \{v_4, v_5\}$	$U = \{1, 7\}$
(b)	$v_4 = 4-2 = 2$ $v_5 = 4-2 = 2$	$v_1 = 3-2 = 1$ $v_7 = 2-2 = 0$
(c)	n/a	schedule v_7
(d)	schedule v_4	n/a

i = 3

(a)	$U = \{v_5\}$	$V = \{1, 8\}$
(b)	$v_5 = 4-3 = 1$	$v_1 = 3-3 = 0$ $v_8 = 3-3 = 0$
(c)	n/a	schedule v_1 & v_8
(d)	schedule v_5	n/a

~~$a_2 = 1$ ALU~~ → 2ALU

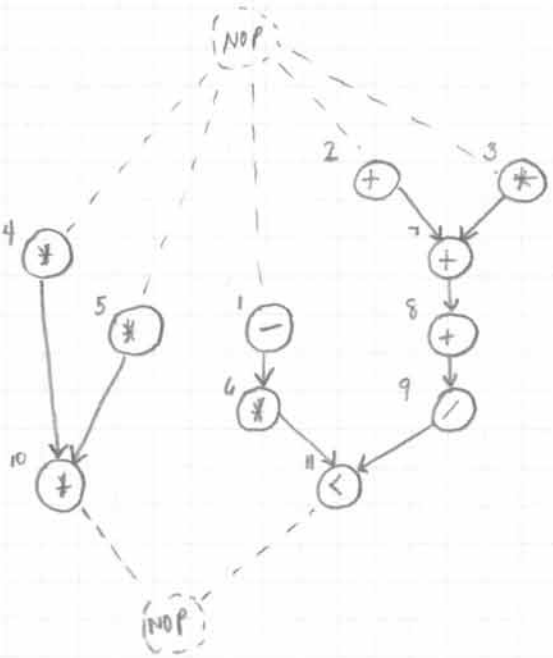
i = 4

	mult	ALU
	$u = \{v_{10}, v_6\}$	$u = \{9\}$
(b)	$v_{10} = 5-4 = 1$ $v_6 = 4-4 = 0$	$v_9 = 4-4 = 0$
(c)	schedule v_6	schedule v_9
(d)	n/a	n/a

i = 5

(a)	$u = \{v_{10}\}$	$u = \{v_{11}\}$
(b)	$v_{10} = 5-5 = 0$	$v_{11} = 5-5 = 0$
(c)	schedule v_{10}	schedule v_{11}
(d)	n/a	n/a

SOLUTION



t1
t2
t3
t4
t5

1 mult, 2 ALU } min resource needed.

#2 consider following CDFG (subset of larger CDFG), assume latency = 4

- compute time frame, operator/type probability, and distribution graph
- use FDS to find best time slot to schedule V_4

① time frame

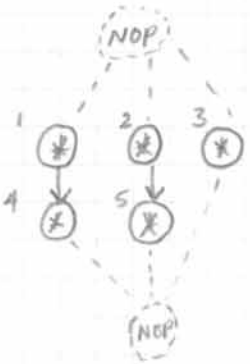
$V_1 = [1, 3]$

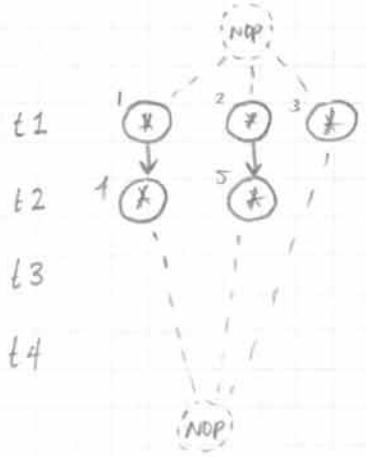
$V_2 = [1, 3]$

$V_3 = [1, 4]$

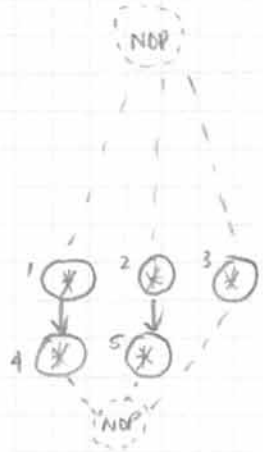
$V_4 = [2, 4]$

$V_5 = [2, 4]$





ASAP



ALAP

② operation / type probability

V_1	$p(1) = 0.3$	$p(2) = 0.3$	$p(3) = 0.3$	$p(4) = 0$
V_2	$p(1) = 0.3$	$p(2) = 0.3$	$p(3) = 0.3$	$p(4) = 0$
V_3	$p(1) = 0.25$	$p(2) = 0.25$	$p(3) = 0.25$	$p(4) = 0.25$
V_4	$p(1) = 0$	$p(2) = 0.3$	$p(3) = 0.3$	$p(4) = 0.3$
V_5	$p(1) = 0$	$p(2) = 0.3$	$p(3) = 0.3$	$p(4) = 0.3$

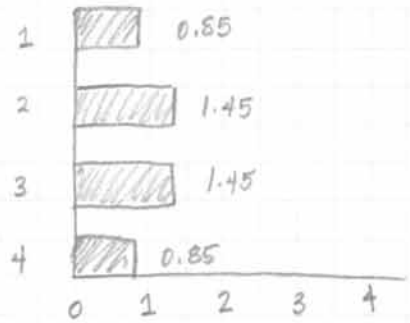
③ distribution chart for multiply

$q(1) = 0.3 + 0.3 + 0.25 + 0 + 0 = 0.85$

$q(2) = 0.3 + 0.3 + 0.25 + 0.3 + 0.3 = 1.45$

$q(3) = 0.3 + 0.3 + 0.25 + 0.3 + 0.3 = 1.45$

$q(4) = 0 + 0 + 0.25 + 0.3 + 0.3 = 0.85$



choose lowest force for v_4

t=2

self = 1.45(1-0.3) + 1.45(0-0.3) + 0.85(0-0.3)
= 1.015 + (-0.435) + (-0.255)
= 0.325

pred = 0.85(1-0.3) + 1.45(0-0.3) + 1.45(0-0.3)
= 0.595 + (-0.435) + (-0.435)
= -2.75

v_1 must run at t1 so v_4 can run at t2

succ = 0

no successor nodes

force = self + pred + succ
= 0.325 + (-2.75) + 0
= -2.425

t=3

self = 1.45(0-0.3) + 1.45(1-0.3) + 0.85(0-0.3)
= (-0.435) + 1.015 + (-0.255)
= 0.325

pred = 0

v_1 can run at t1 or t2, thus its not implicitly scheduled

succ = 0

no successor nodes

total = 0.325 + 0 + 0
= 3.25

t=4

self = 1.45(0-0.3) + 1.45(0.03) + 0.85(1-0.3)
= (-0.435) + (-0.435) + 0.595
= -0.275

pred = 0

succ = 0

total = -0.275 + 0 + 0
= -0.275

∴ v_4 should be scheduled at t=2