

Review Problem 12

❖ How would the ALU's flags be used to help with each of the following branches? The first is filled in for you:

❖ B.EQ: SUBS X31, <val1>, <val2>; use zero flag

❖ B.NE: " " " " ; $\overline{\text{zero}}$

❖ B.GE: " " " " ; $\overline{\text{negative} \oplus \text{overflow}}$

❖ B.GT: " " " " ; $(\overline{\text{negative} \oplus \text{overflow}}) \& \overline{\text{zero}}$

❖ B.LE: " " " " ; $\text{negative} \oplus \text{overflow} \mid \text{zero}$

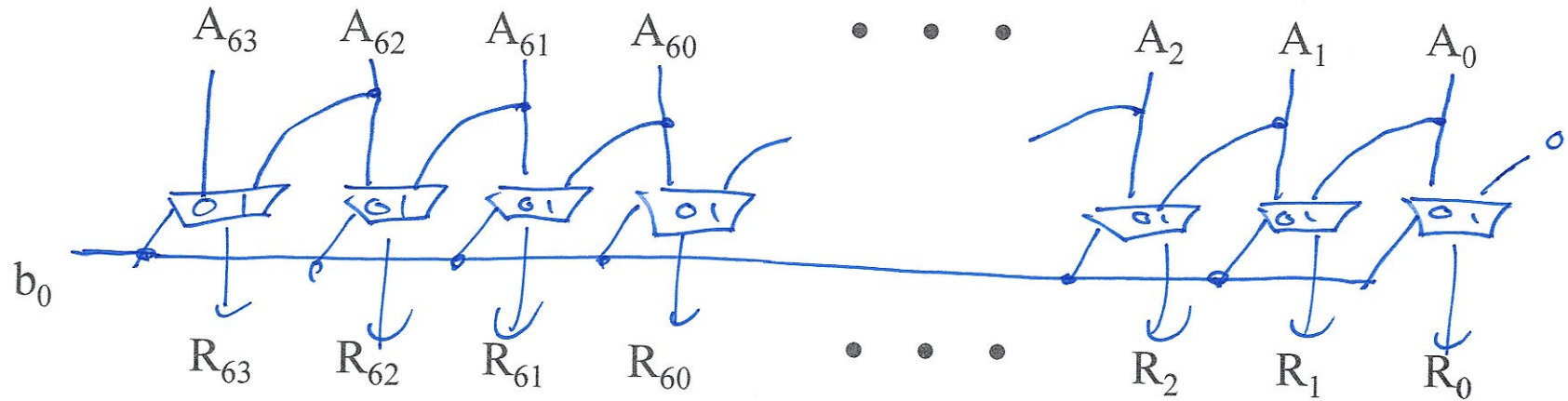
❖ B.LT: " " " " ; $\text{negative} \oplus \text{overflow}$

LSL dest, A, #5

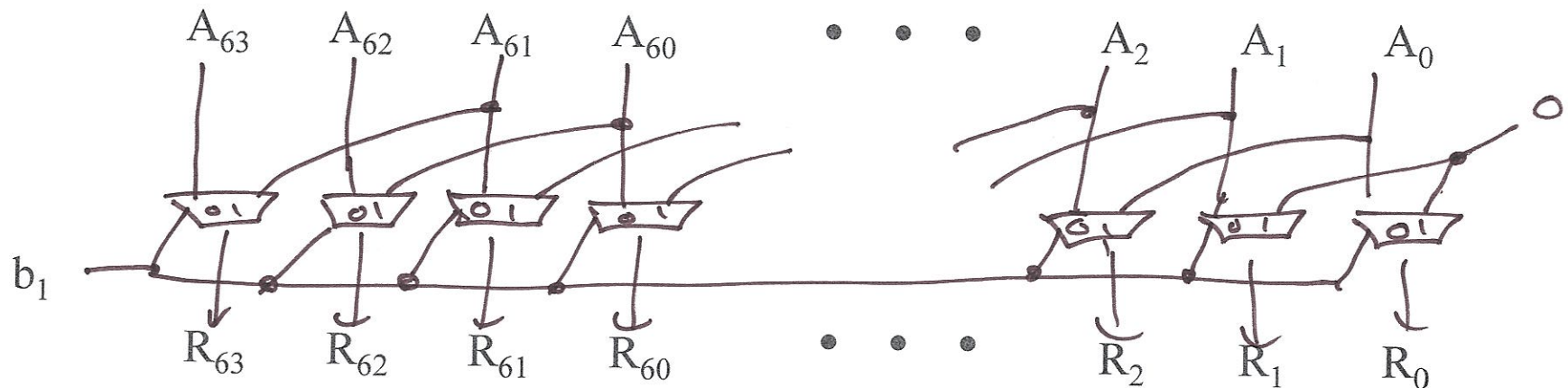
Shifter

Support shift operations: ($A \ll 001101$)

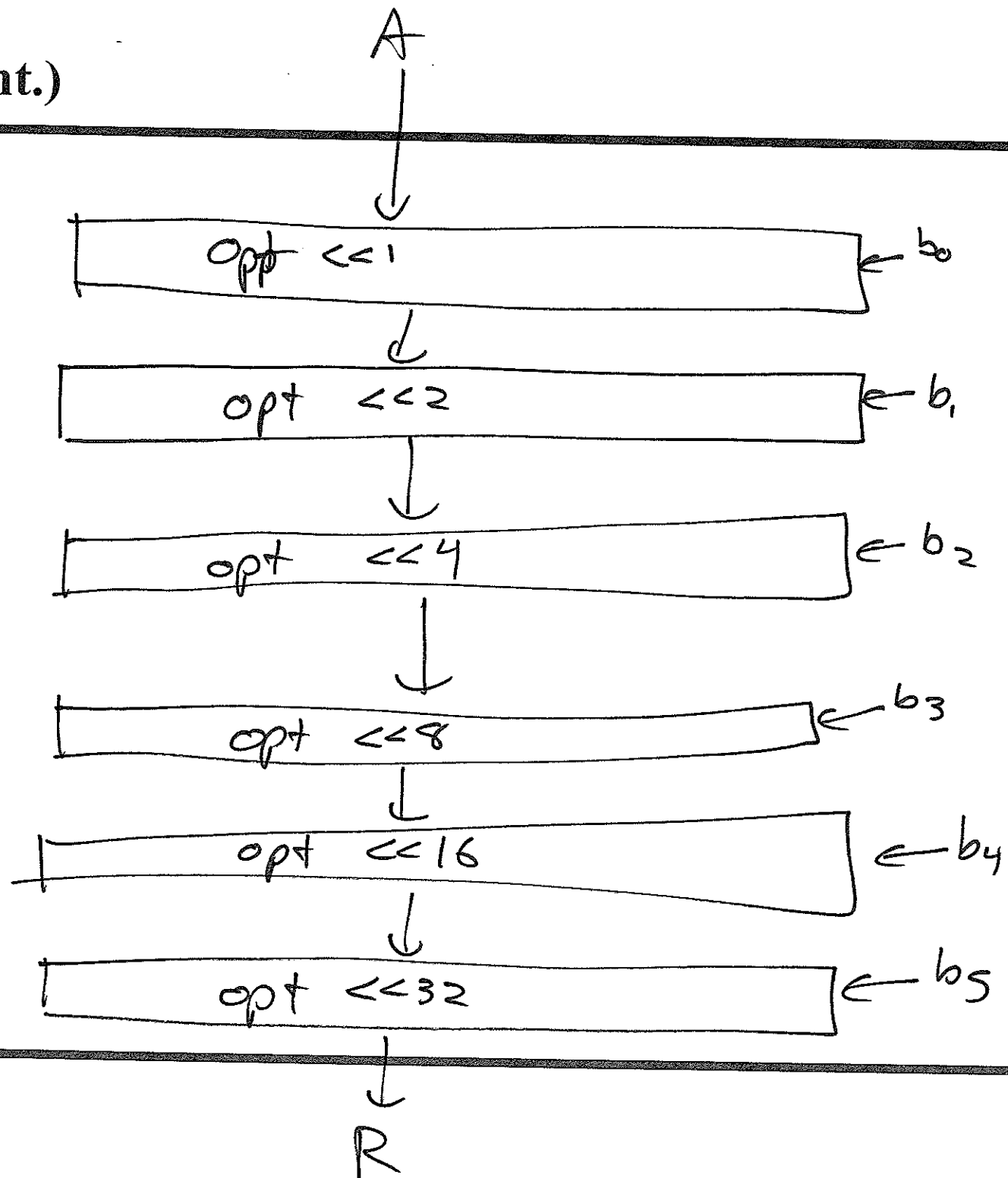
Optional shift by one: ($A \ll b_0$)



Optional shift by two: ($A \ll b_1$)



Shifter (cont.)



Multiplication

Example

Multiplicand: 0 1 1 0 6
Multiplier: 0 1 0 1 5

4 partial products

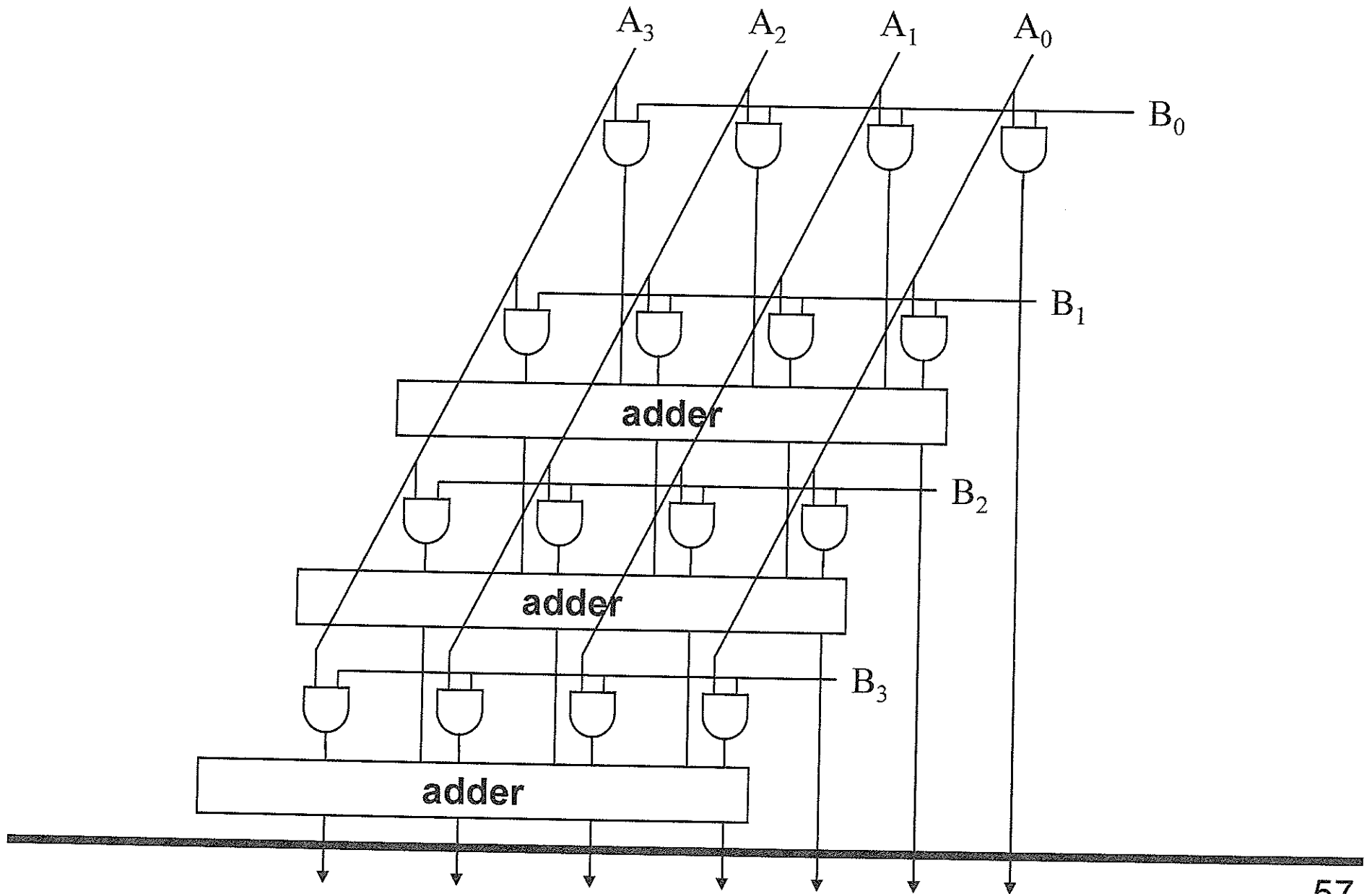
30

Repeat n times:

Compute partial product; shift; add

NOTE: Each bit of partial products is just an AND operation

Parallel Multipliers



Computer “Performance”

Readings: 1.6-1.8

BIPS (Billion Instructions Per Second) vs. GHz (Giga Cycles Per Second)

Throughput (jobs/seconds) vs. Latency (time to complete a job)

Measuring “best” in a computer

3.0 GHz

The PowerBook G4 outguns Pentium III-based notebooks by up to 30 percent.*

* Based on Adobe Photoshop tests comparing a 500MHz PowerBook G4 to 850MHz Pentium III-based portable computers

Hyper
Pipelined
Technology

Performance Example: Homebuilders

Builder	Time per House	Houses Per Month	House Options	Dollars Per House
Self-build	24 months	1/24	Infinite	\$200,000
Contractor	3 months	1	100	\$400,000
Prefab	6 months	1,000	1	\$250,000

Which is the “best” home builder?

Homeowner on a budget? *\$/house*

Rebuilding Haiti? *Houses per month*

Moving to wilds of Alaska? *Time per house*

Which is the “speediest” builder?

~~Latency~~: how fast is one house built?

Throughput: how long will it take to build a large number of houses?