# Chapter Exam

## Appendix C-The Basics of Logic Design Part 2

**2012/03/20**

**1.** What is the difference between D flip-flops and latches? **(10%)**

**2.** Both the register file and the SRAM are built with D-latches. What are the differences between the register file and the SRAM? **(15%)**

**3.** What is the difference between Moore and Mealy machine? **(10%)**

**4.** What is the difference between synchronous and asynchronous logic? **(10%)**

**5.** Derive the logic equations (5.a, 5.b, 5.c, 5.d and 5.e) of a 16-bit CLA (carry look ahead) adder below. There is no need to simplify the equations. **(25%)**

$g_i = a_i \cdot b_i$ $\quad p_i = a_i + b_i$

$P0 = p3 \cdot p2 \cdot p1 \cdot p0$

$P1 = p7 \cdot p6 \cdot p5 \cdot p4$

$P2 = p11 \cdot p10 \cdot p9 \cdot p8$

$P3 =$ 5.a

$G0 = g3 + (p3 \cdot g2) + (p3 \cdot p2 \cdot g1) + (p3 \cdot p2 \cdot p1 \cdot g0)$

$G1 = g7 + (p7 \cdot g6) + (p7 \cdot p6 \cdot g5) + (p7 \cdot p6 \cdot p5 \cdot g4)$

$G2 =$ 5.b

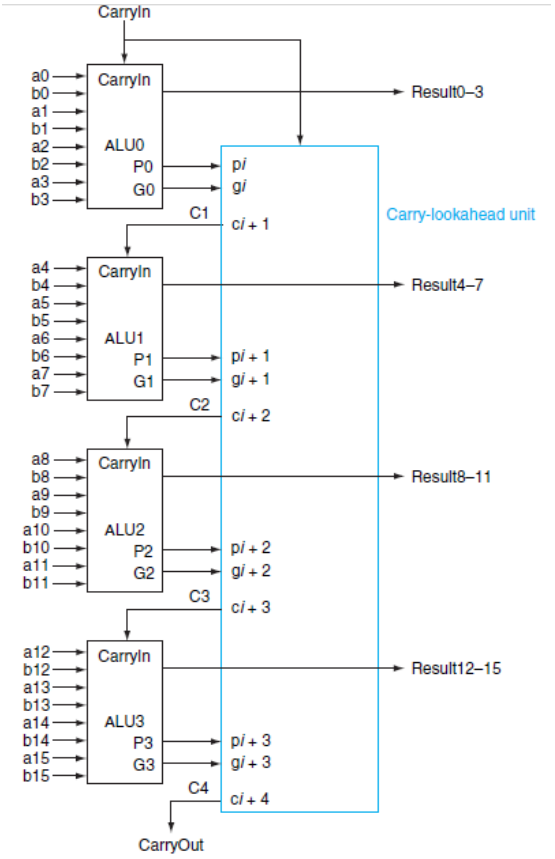
$G3 =$ 5.c

$C1 = G0 + (P0 \cdot c0)$

$C2 = G1 + (P1 \cdot G0) + (P1 \cdot P0 \cdot c0)$

$C3 =$ 5.d

$C4 =$ 5.e



**6.** A friend would like you to build an "electronic eye" for use as a fake security device. The device consists of three lights lined up in a row, controlled by the outputs Left, Middle, and Right, which, if asserted, indicate that a light should be on. Only one light is on at a time, and the light "moves" from left to right and then from right to left. Note that the rate of the eye's movement will be controlled by the clock speed (which should not be too great) and that there are essentially no inputs.

(1) Draw the graphical representation for the finite-state machine used to specify the electronic eye. **(15%)**

(2) Assign state numbers to the states of the finite-state machine you constructed and write a set of logic equations for each of the outputs, including the next-state bits. **(15%)**