

Integrated Circuit 2: Examination

2017/1/30(Mon) 08:45~10:15@105

※ メモなし講義資料(手書きの書き込みも可)・自筆ノート・書籍のみ持込可。

※ 解答は導出過程を含めてすべて答案用紙(日本語でも英語でもよい)に記入すること。

1. Let's discuss on the architecture of adders. Assume the i -th bit of input signals A and B to be A_i and B_i , respectively, and the i -th bit of the sum and the carry output to be S_i and C_i , respectively. Assume that the generation and the propagation term in i -th bit to be G_i and Q_i , respectively. (30)

(1) Write G_i and Q_i in Boolean expression.

(2) Write S_i and C_i in Boolean expression using G_i and Q_i .

(3) Write C_0 , C_1 , C_2 , and C_3 with using the carry look-ahead architecture in Boolean expression of A_i and B_i .

(4) Assume the propagation delay of any type of single logic gate with n inputs, $T(n)$, to be proportional to the number of inputs, n ; $T(n)=nT_0$. Derive the propagation delay of 4bit ripple-carry adder and carry look-ahead adder.

(5) Derive the propagation delay of 8bit adder using the architecture of (a)8bit ripple carry adder, (b)connected two 4bit carry look-ahead adder, and (c)8bit carry look-ahead adder.

2. Figure 1 illustrates the DRAM cell array for 4 bits. The capacitor in each memory cell is charged to V_{DD} or discharged to zero at initial condition as shown in Fig.1. The signal PRE equalizes the voltages of both DL and DLb to $V_{DP}=V_{DD}/2$ when PRE=1. The signal SA controls the sense amplifier that changes the DL and DLb voltages when SA=1 so the higher one of them to V_{DD} , while the lower one to zero. Draw the waveforms of DL and DLb for the given control signals illustrated on the answer sheet. Note that $V_o^{(0)}$ and $V_o^{(1)}$ are the voltages of DL after charge distribution between DL and the memory cell capacitor, whose voltage is zero and V_{DD} , respectively. (20)

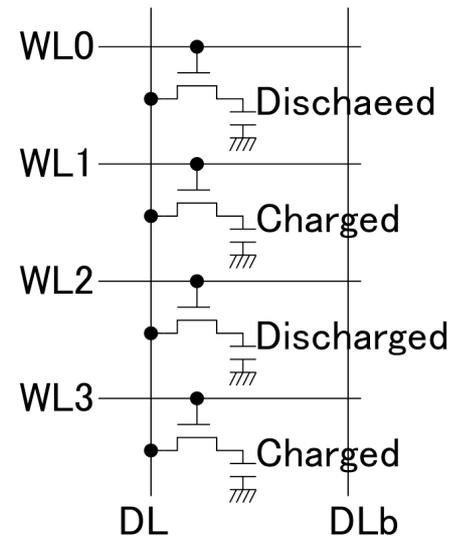


Fig. 1

3. Compare and discuss the pros and the cons of RISC and CISC architectures from (at least three) viewpoints related to LSI technologies. (20)

4. 【予告問題】Discuss the topic on “MOSFET's Scaling, or Moore's Law” in terms of social, technical, and economical impacts. Your opinion is welcome. Write it down on A4-size paper (hand-written material only). (20)

5. Describe your reflection (振り返り) and impressions on what you have learnt in this class, in terms of how they effect your daily and long term life, and the context you have learnt in other classes. (10)