Integrated Circuit C Examination

※　手書きの書き込みのある講義資料・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 connect between transistor-level circuit and functional blocks.(60)
(1) Show each MOSFET's state (on(○) or off(×)) in the circuit of Fig.1 for input of (a)S=0 and (b)S=1. For example, in case of M3 is on, while other MOSFETs are off, write as "×-×-○-×-×-×", which is described as M1～M6 order.
(2) Describe the truth table of the circuit in Fig.1. Note that the inputs are A and S, the outputs are B and C.
Let's describe the circuit in Fig.1 as the functional block as shown in Fig.2.
(3) Show outputs {X3:X0} of the circuit in Fig.3 for inputs {A3:A0} as "1000", for case of (a)S=0 and (b)S=1.
(4) Show outputs {X3: X0} of the circuit in Fig.4 for inputs {A3:A0} as "1000", for case of (a)S0=S1=0 and (b)S0=1 and S1=0, (c)S0=0 and S1=1=1, and (d)S0=S1=1.
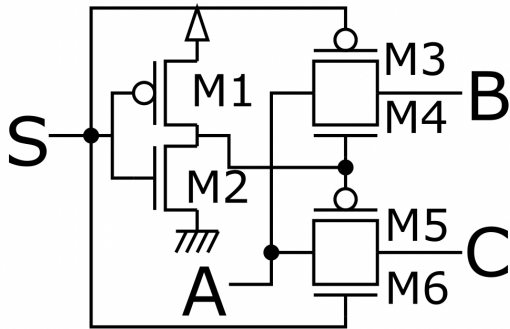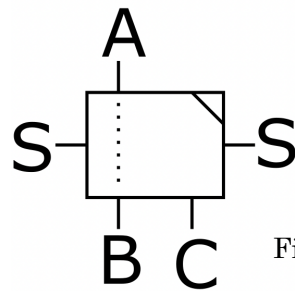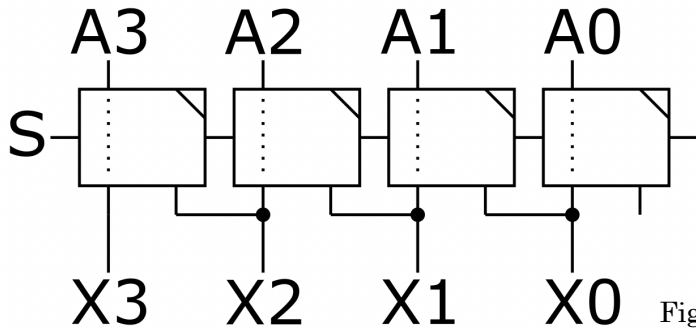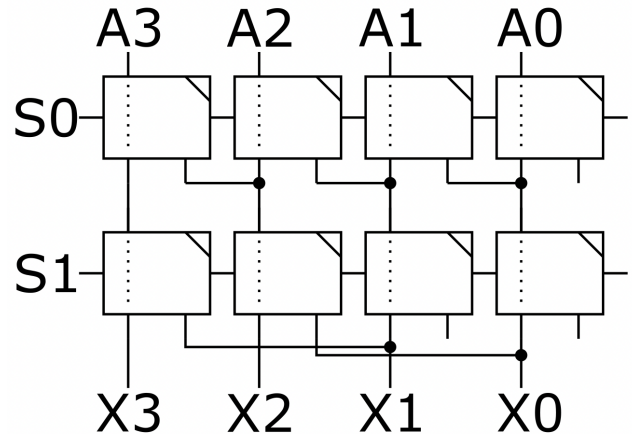

Fig.1

Fig.2

Fig.3

Fig.4

2. Discuss the pros and the cons of the ripple carry adder compared with the carry look-ahead adder (CLA). The following keywords MUST be included: carry propagation delay（キャリー伝搬遅延）, circuit complexity（回路の複雑さ）, circuit regularity（回路の規則性）(30)

3.【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 AND your personal experience MUST be included. Write it down on A4-size paper (hand-written material only, in Japanese or English). (10)