22446 Microprocessors (Spring 2011)

Second Exam

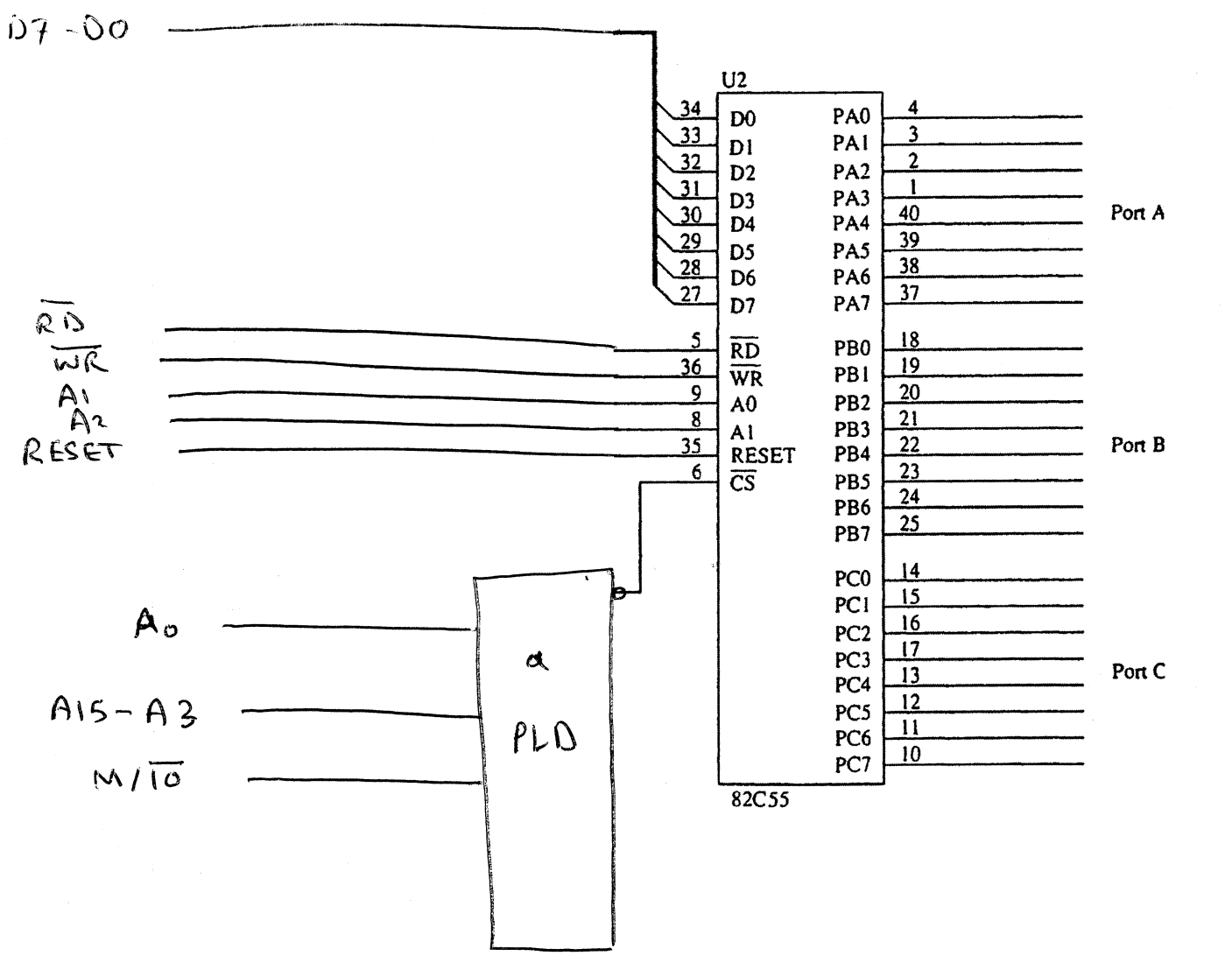
Solution

الاسم: رقم التسجيل: رقم الشعبة:

Instructions: Time **50** min. Closed books & notes. No calculators or mobile phones. No questions are allowed. Show your work clearly. Every problem is for 5 marks. Active low signals are shown with a slash, e.g., /CE.

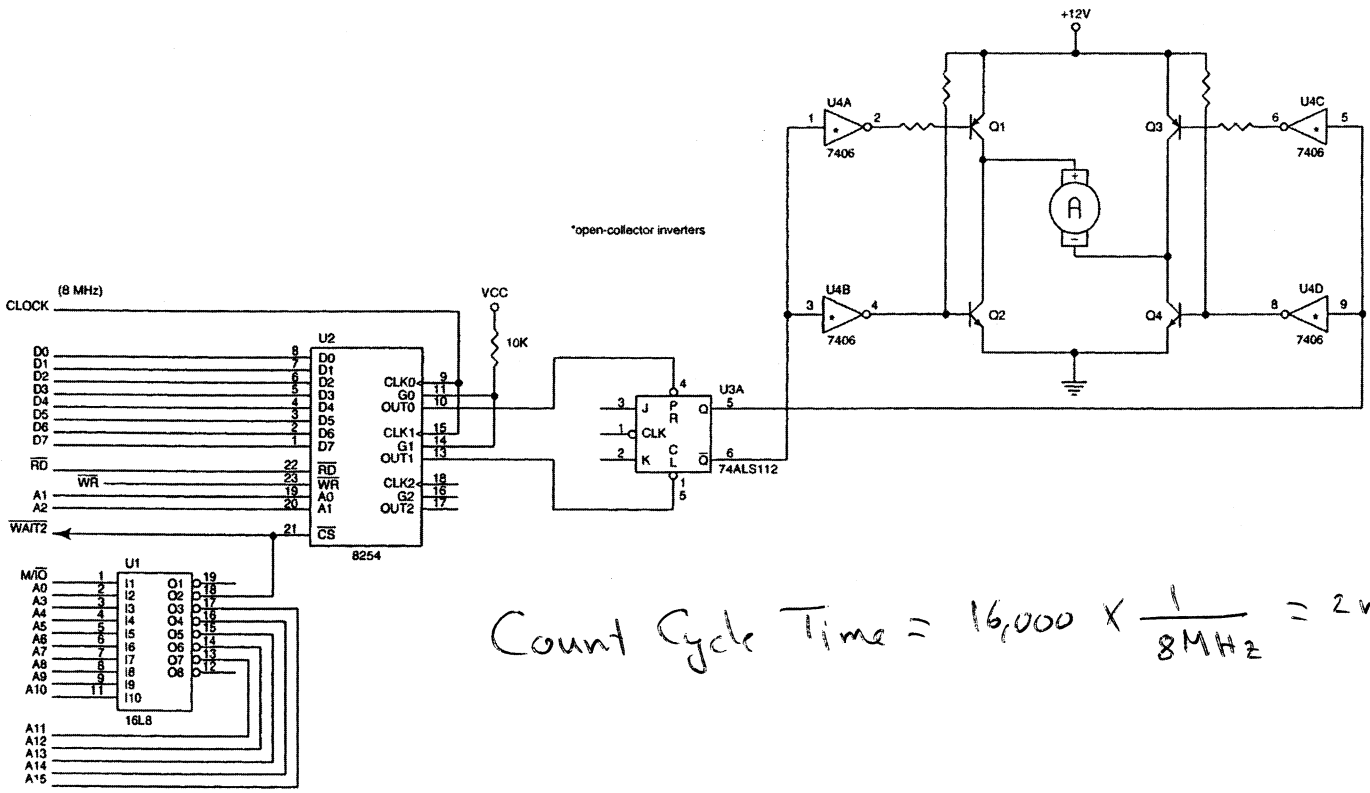
Q1. Using a PLD, interface the 82C55 shown below to the 8086 microprocessor so that it functions at I/O locations 4440H, 4442H, 4444H, and 4446H. Your interface circuit must show the connections of all the pins on the left side of the 82C55. You must also specify the Boolean expression(s) that the PLD implements.

A15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	1	0	0	0	1	0	0	0	1	0	0	0	X	X	0

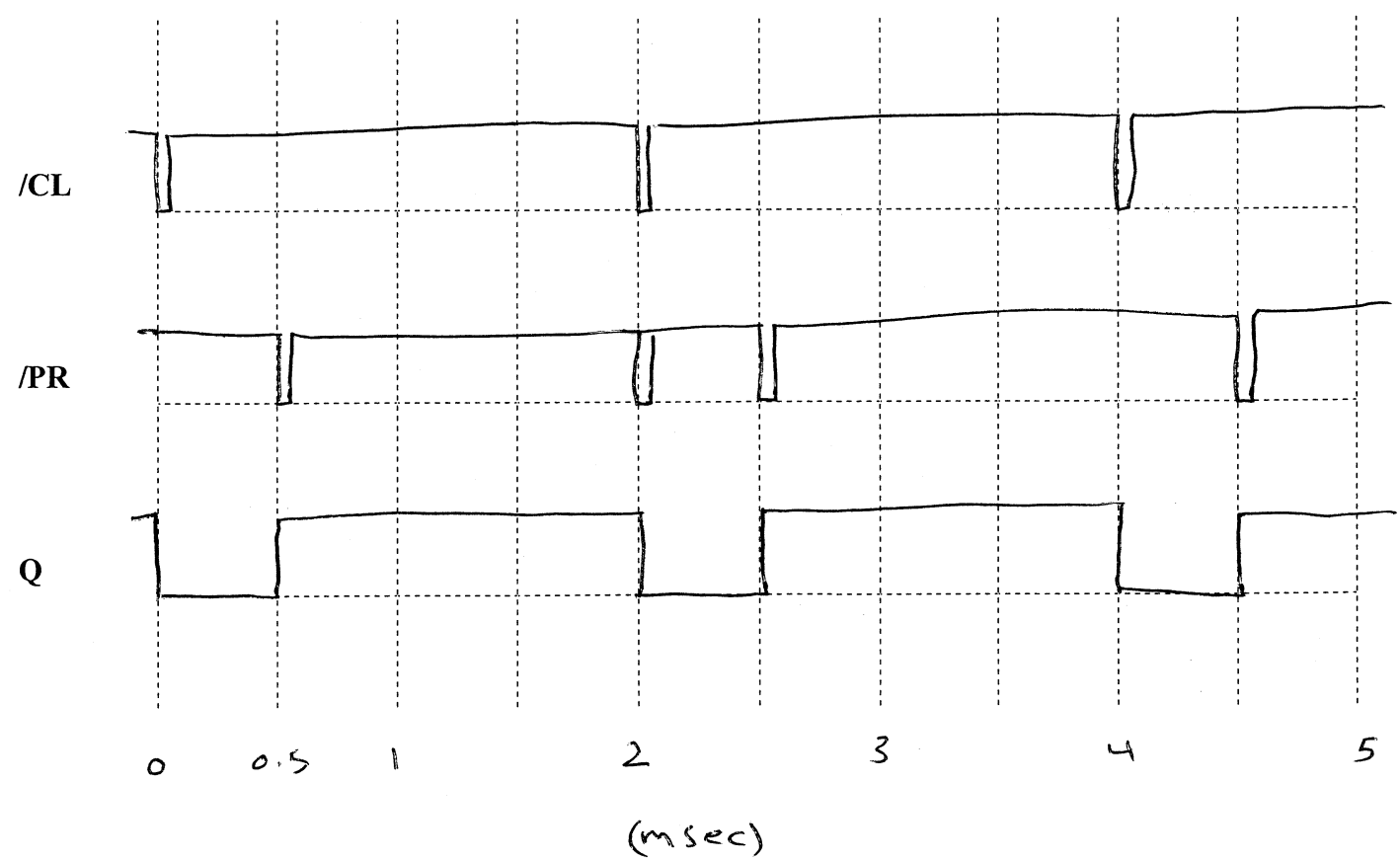


$$\overline{CS} = \overline{M/\overline{IO} \cdot \overline{A_{15}} \cdot A_{14} \cdot \overline{A_{13}} \cdot \overline{A_{12}} \cdot \overline{A_{11}} \cdot A_{10} \cdot \overline{A_9} \cdot \overline{A_8} \cdot \overline{A_7} \cdot A_6 \cdot \overline{A_5} \cdot \overline{A_4} \cdot \overline{A_3} \cdot \overline{A_0}}$$

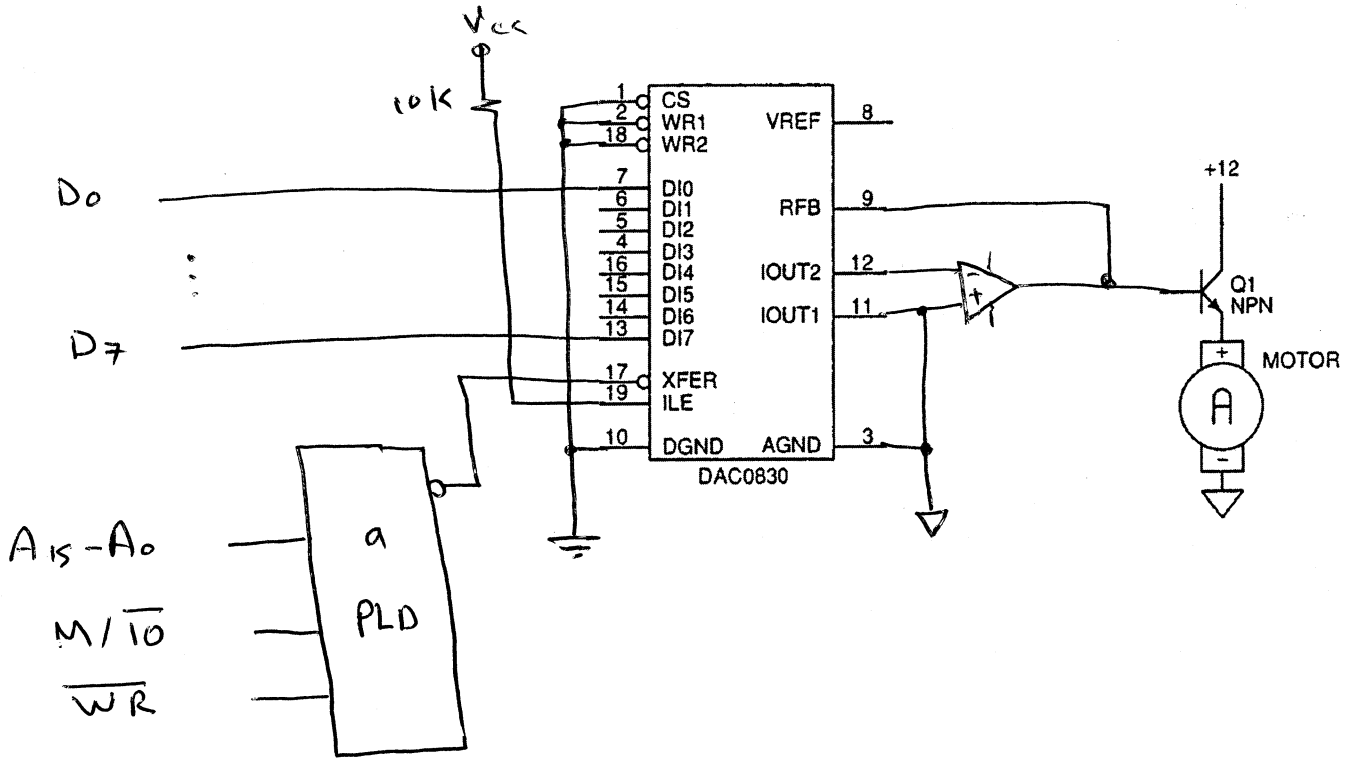
Q2. In the circuit shown below, the Programmable Interval Timer (8254) is used to control the speed and direction of the shown DC motor. Given that Counters 0 and 1 operate in Mode 2 and are programmed using count 16,000, draw, in the grid provided below, the flip-flop (74ALS112) signals /CL, /PR, and Q. Note that both counters operate on 8-MHz clock and Counter 0 lags Counter 1 by 0.5 msec. You must specify the time scale you use.



Count Cycle Time = $16{,}000 \times \frac{1}{8\,MHz} = 2$ msec



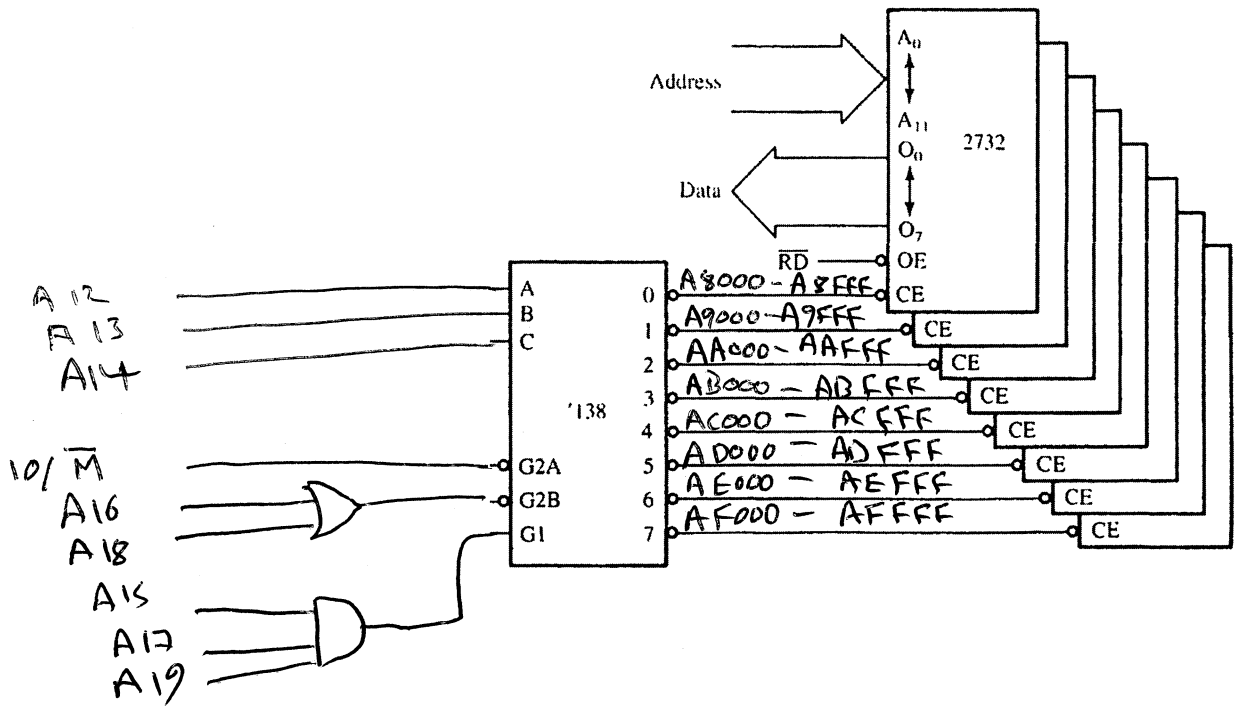
Q3. Interface the DAC0830 shown below to the 8086 microprocessor so that it operates at I/O port 0AA0H and controls the DC motor shown to the right. Your interface circuit must show the connections of all the DAC0830 pins. Also complete the needed circuit to control the DC motor. If you use any PLD, you must also specify the Boolean expression(s) that the PLD implements.



0	A	A	0
0000	1010	1010	0000

$$\overline{XFER} = \overline{M/\overline{IO} \cdot WR \cdot \overline{A_{15}} \cdot \overline{A_{14}} \cdot \overline{A_{13}} \cdot \overline{A_{12}} \cdot A_{11} \cdot \overline{A_{10}} \cdot A_9 \cdot \overline{A_8} \cdot A_7 \cdot \overline{A_6} \cdot A_5 \cdot \overline{A_4} \cdot \overline{A_3} \cdot \overline{A_2} \cdot \overline{A_1} \cdot \overline{A_0}}$$

Q4. Interface the 8 EPROM chips shown below to the 8088 microprocessor so that they operate at the starting address A8000H. Your interface circuit must show the connections of all the 3-to-8 decoder's pins. Also specify, for each of the 8 decoder outputs, the address range that it selects. If you use any PLD, you must also specify the Boolean expression(s) that the PLD implements.

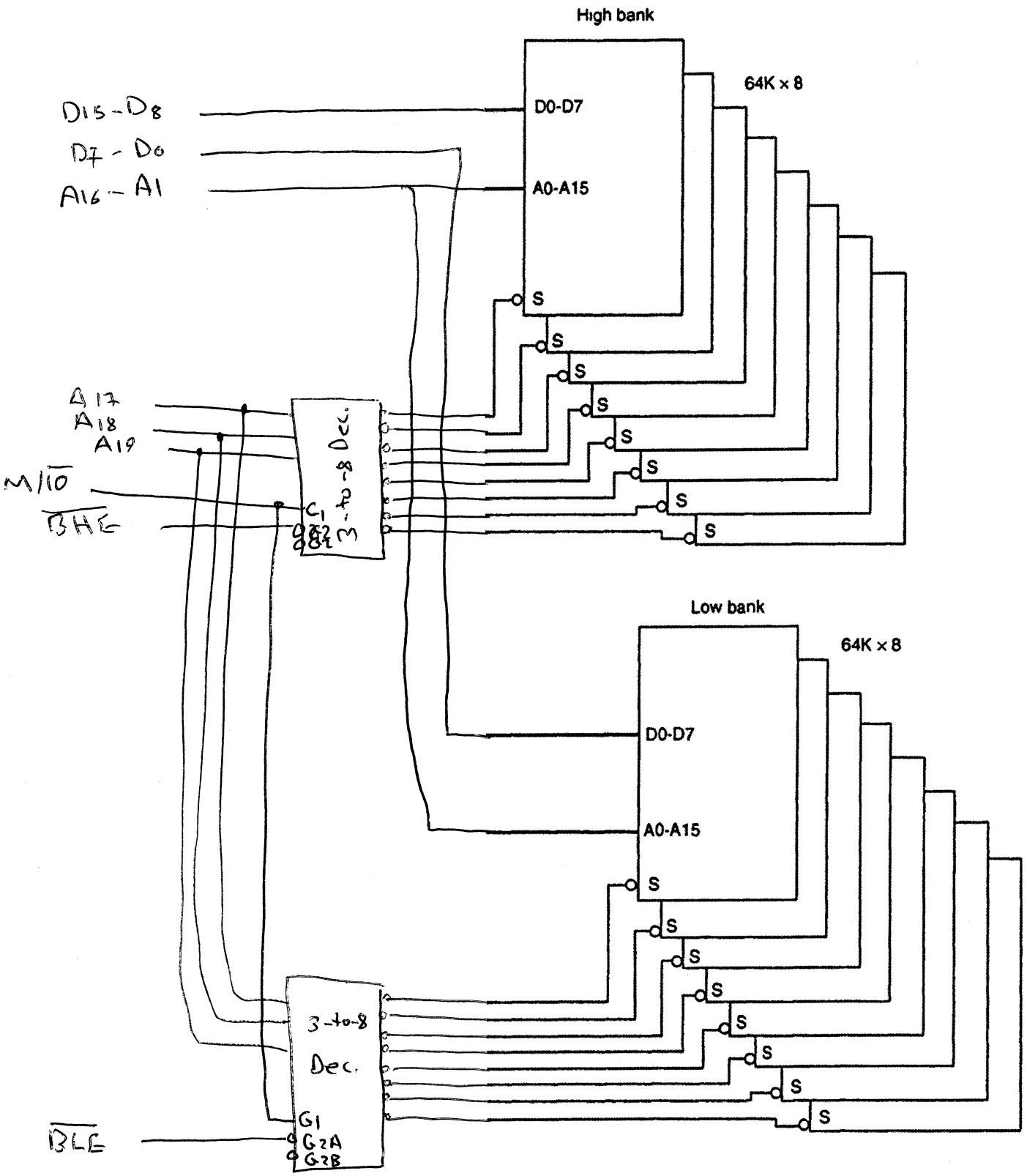


Address lines: 19 18 17 16 15 <3> 14 13 12 <12> 11 10 9 8 7 6 5 4 3 2 1 0

1 0 1 0 1 — select chip — selects location in the chip

No PLD used.

Q5. Interface the 16 memory chips shown below to the 8086 microprocessor so that they operate at the starting address 00000H. You must use separate bank decoders to interface the two banks and must show all needed connections with the 8086 microprocessor. If you use any PLD, you must also specify the Boolean expression(s) that the PLD implements.



$A_{19}\ A_{18}\ A_{17}$ — select chip

$A_{16} \cdots A_1$ — select location

<Good Luck>