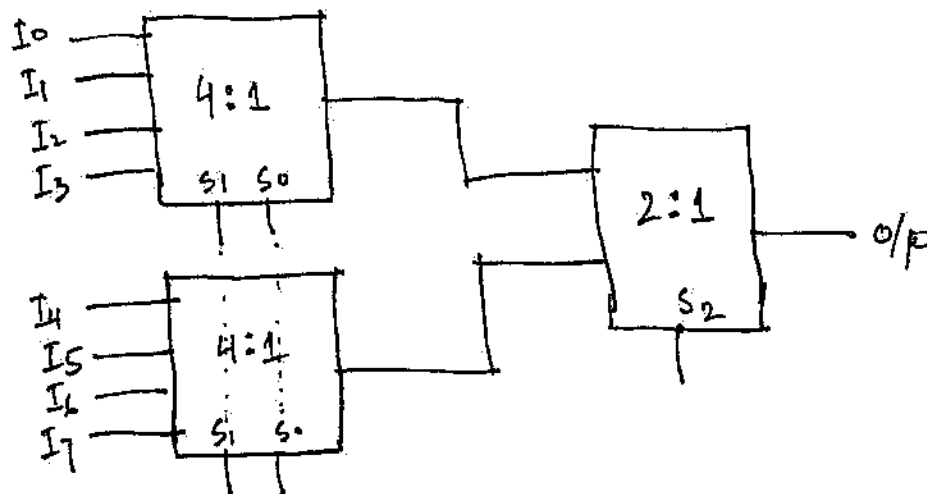


**Instructions:** You must show your work and put your final answers in the blanks. If you round a numerical answer, you must give at least 3 significant digits.

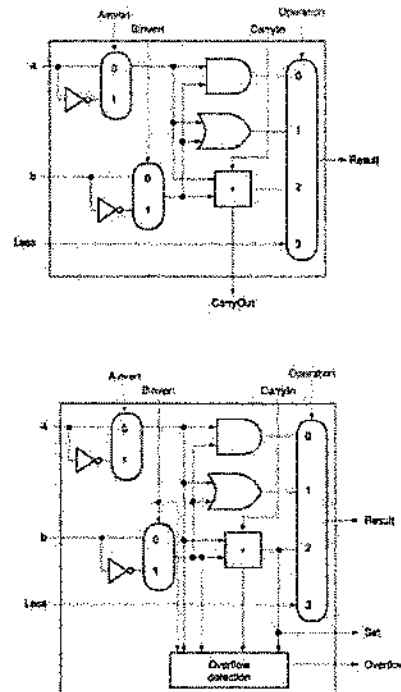
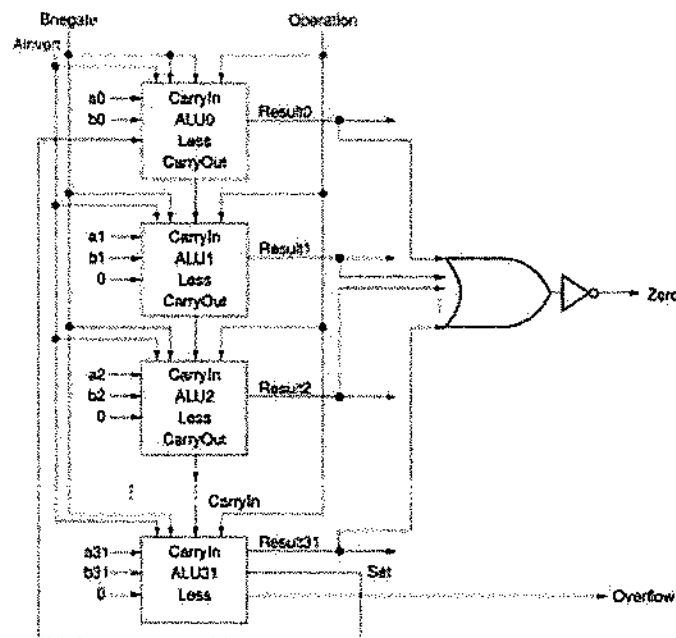
**Q1.** What is a multiplexer? Design an 8-to-1 multiplexer using 4-to-1 and 2-to-1 multiplexer.

**ANS:**

A multiplexer is a combinational circuit that rout one of its ' $2^n$ ' inputs to its output based on its ' $n$ ' select lines.



**Q2.** The ALU diagram we covered in class is attached below:



Based on the ALU diagram above, determine the line control code [ $A_{\text{invert}}$  (1 bit),  $B_{\text{invert}}$  (1 bit), Operation (2 bit)] for the 'nor' and 'and' functions.

(Note: You might need to use DeMorgan Law: (1)  $(A.B)' = A' + B'$  and (2)  $(A+B)' = A'.B'$ )

**NOR: 1100**

**OR: 0001**

**AND: 0000**

**NAND: 1101**

Final Answer = \_\_\_\_\_