

**Physics 517/617 Homework 7**  
**This HW and ALL LABs DUE:**  
**Friday June 3, 2011 Last Day of Classes**

1) Using truth tables, verify the following De Morgan's Law:

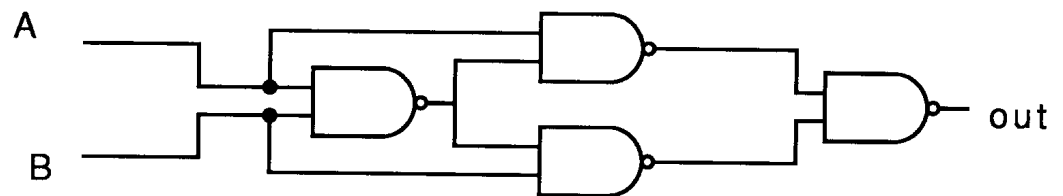
$$\overline{A \bullet B} = \overline{A} + \overline{B}$$

2) Using twos-complement notation show in 8 bit arithmetic that 32-64 is -32.

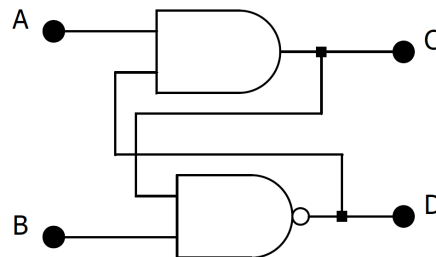
3) Prove the following Boolean algebraic equalities:

- a)  $\overline{\overline{A}} = A$
- b)  $A + BC = (A+B)(A+C)$
- c)  $A + \overline{A}B = A + B$
- d)  $AB + \overline{A}C = AB + BC + \overline{A}C$
- e)  $AB + A\overline{B} + \overline{A}B = A + B$

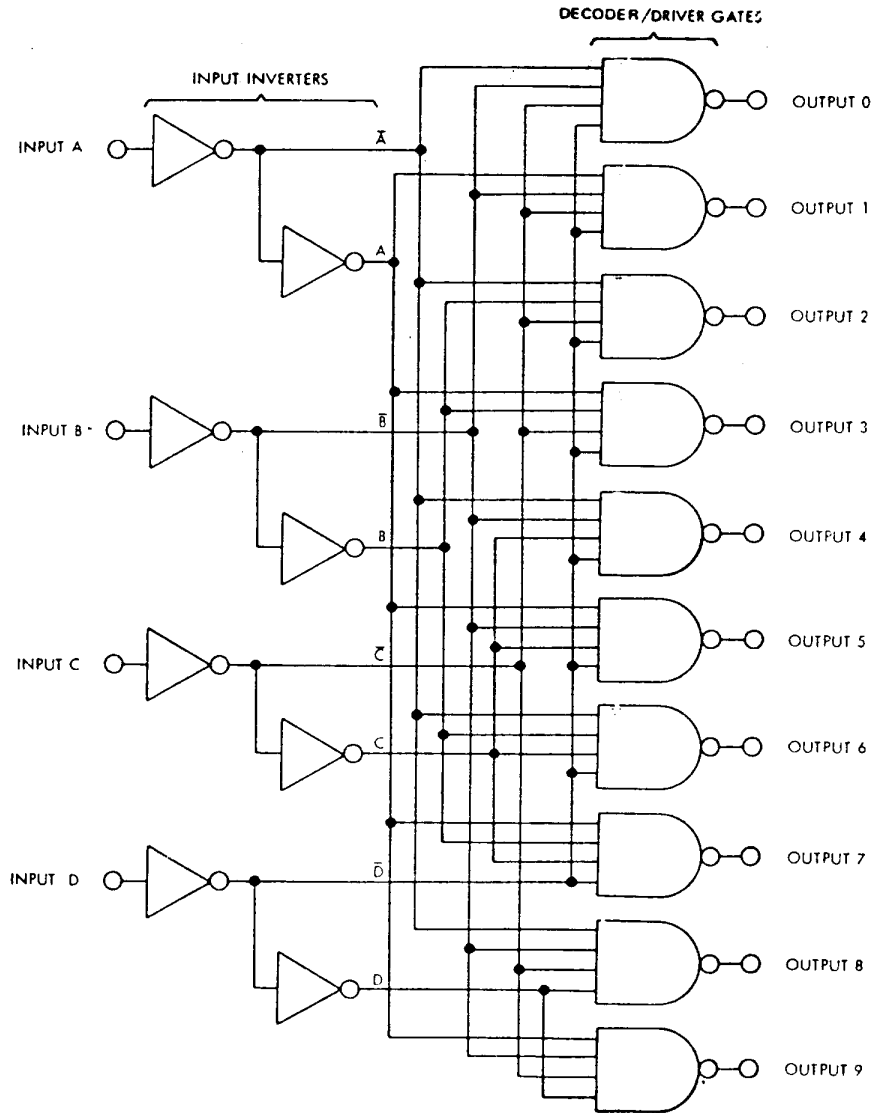
4) Generate a truth table for the following circuit:



5) Generate a truth table for the following circuit.



6) By generating the truth table show that the following circuit converts a BCD input to a decimal output.



7) Design a divide-by-five asynchronous counter and state its count sequence.