Exam 1
EET 242
Sequential Circuits and Applications

Name:

1. (15 Points) Determine the outputs of a full adder for each of the following inputs:

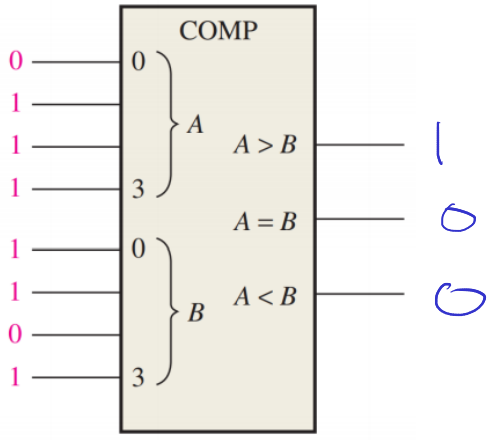
(a) A =1, B = 0, C_{in}= 1

$C_{out} = 1$ $\quad$ $\Sigma = 0$

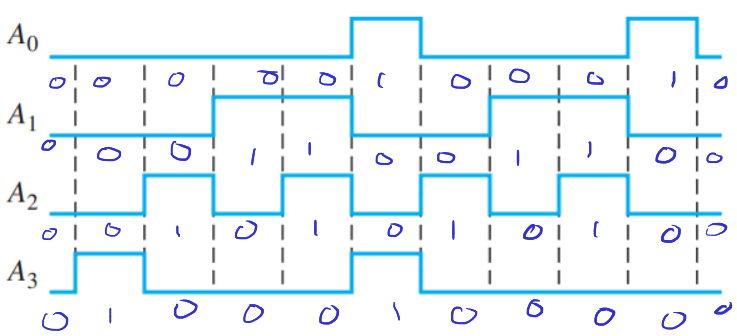
(b) A =0, B = 0, C_{in}= 1

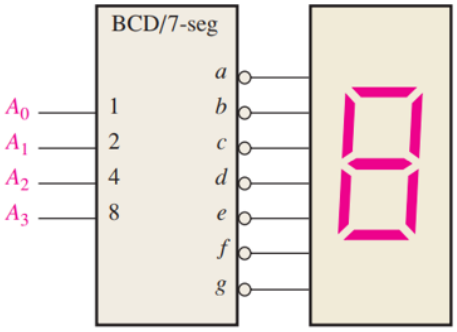
$C_{out} = 0$ $\quad$ $\Sigma = 1$

2. (15 Points) Determine the A = B, A > B, and A < B outputs for the input numbers shown on the comparator in the following Figure. (10 Points)



3. (20 Points) A 7-segment decoder/driver drives the display in the following Figure. If the waveforms are applied as indicated, determine the sequence of digits that appears on the display.

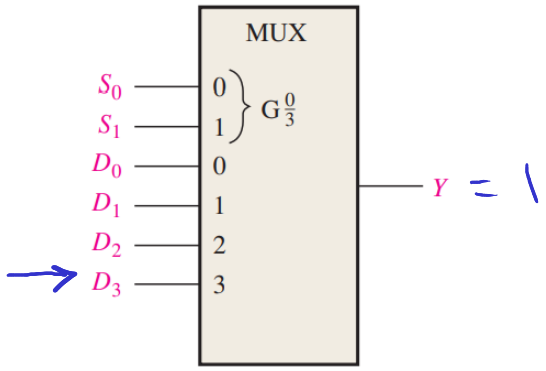




0000, 0001, 0010, 0100, 0110, 1001, 0010, 0100, 0110
0 1 2 4 6 9 2 4 6
1000, 0000
8 0

Sequence of digits are in pink below the bcd

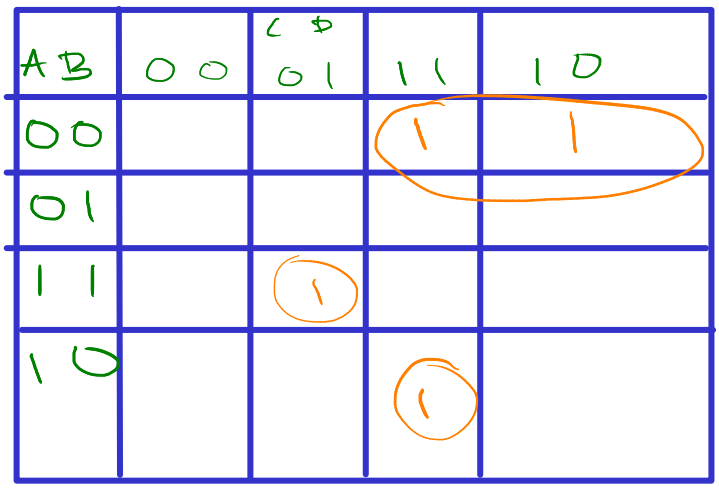
4. (20 Points) For the multiplexer shown in the following figure, determine the output for the following input states: $D_0 = 1$, $D_1 = 0$, $D_2 = 1$, $D_3 = 1$, $S_0 = 1$, $S_1 = 1$.



5. (20 Points) Use a Karnaugh map to minimize the following SOP expression:

$\bar{A}\bar{B}C + A\bar{B}CD + AB\bar{C}D$

0010 1011 1101
0011



SOP Can not be minimized

$\bar{A}\bar{B}C + A\bar{B}CD + A\bar{B}\bar{C}D$

6. (15 Points) Using Boolean algebra, simplify following expression. Clearly state the laws, rules, and identities used.

$$\bar{A}\bar{B}C + \bar{A}B\bar{C} + \bar{A}BC + A\bar{C}\bar{D} + ABD$$

$\bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + A\bar{C}\bar{D} + ABCD$ R12 Distributive law

$= \bar{A}\bar{B}(C + \bar{C}) + \bar{A}B\bar{C} + A\bar{C}\bar{D} + ABD$ Rule 6 $C + \bar{C} = 1$

$= \bar{A}\bar{B}(1) + \bar{A}B\bar{C} + A\bar{C}\bar{D} + ABD$ Rule 4 $A(1) = A$

$= \bar{A}\bar{B} + \bar{A}B\bar{C} + A\bar{C}\bar{D} + ABD$ Distribution law $AB + AC = A(B + C)$

$= \bar{A}(B1 + \bar{B}) + A\bar{C}\bar{D} + ABD$ Rule 11 $\bar{A}B + A = A + B$

$= \bar{A}(1 + \bar{B}) + A\bar{C}\bar{D} + ABD$ Dist law

$= \bar{A}C + \bar{A}\bar{B} + A\bar{C}\bar{D} + ABD$ Rule 12 $AC + A\bar{B} = AB + C$

$= \bar{A}\bar{B} + C + A\bar{C}\bar{D} + ABD$