

# CIS 351 Sample BA1 Problem Solutions

Mon 31<sup>st</sup> Jan, 2022

## BA1: Boolean Algebra

(a) Use Boolean algebra to show that  $(B + \bar{C} + \bar{A}B)(BC + A\bar{B} + AC) \iff BC + A\bar{B}\bar{C}$ .

$$\begin{aligned} & (B + \bar{C} + \bar{A}B)(BC + A\bar{B} + AC) \\ & (BBC + BA\bar{B} + BAC) + (\bar{C}BC + \bar{C}A\bar{B} + \bar{C}AC) + (\bar{A}BBC + \bar{A}BA\bar{B} + \bar{A}BAC) \\ & (BBC + A\bar{B}B + ABC) + (B\bar{C}C + A\bar{B}\bar{C} + A\bar{C}C) + (\bar{A}BBC + \bar{A}AB\bar{B} + \bar{A}ABC) \\ & (BC + ABC) + (A\bar{B}\bar{C}) + (\bar{A}BC) \\ & (BC + \bar{A}BC) + A\bar{B}\bar{C} \\ & BC + A\bar{B}\bar{C} \end{aligned}$$

(b) Apply DeMorgan's law to  $\overline{A + B + C(\bar{A} + D)}$  until only single terms are negated. (In other words, you answer may contain  $\bar{A}$ , but not  $\overline{AB}$  or  $\overline{A + B}$ .)

$$\begin{aligned} & \overline{A + B + C(\bar{A} + D)} \\ & \bar{A}\bar{B}(\overline{C(\bar{A} + D)}) \\ & \bar{A}\bar{B}(\bar{C} + \overline{(\bar{A} + D)}) \\ & \bar{A}\bar{B}(\bar{C} + A\bar{D}) \\ & \bar{A}\bar{B}\bar{C} \end{aligned}$$