Kathryn Chamberlin
120887114 EEE425
HW1

Problem 1

a) cost per IC = RE + $\frac{NRE}{volume}$

wafer = $\frac{\text{die cost} + \text{packaging cost} + \text{test cost}}{\text{test yield}}$

die cost = $\frac{\text{wafer cost}}{\#\text{ good dies}}$ → wafer cost = $\frac{\text{cost}}{\text{wafer yield}}$ = $\frac{5000}{0.90}$ = 5555.56

$\#\text{dies on wafer} = ND = \frac{\pi(r_w)^2}{A_D}$ $r_w = 6in(2.54)cm$

$A_D = \frac{\pi(15.24)^2}{12mm \times 12mm} = 506.707$

$DY = \left(\frac{\alpha}{(1 + DD \cdot A_D)}\right)^{\alpha}$ = ~~433~~ = .65

⇒ die cost = 5555.56/(506.707 · .65) = $16.867 (506.707 · .65 = good die)

⇒ $\frac{16.867 + 4.44}{0.85}$ = $29.26 + $\frac{NRE}{\text{good die}}$ $\frac{200M}{400M}$ = 05 = $29.76

b) 200M ⇒ $\frac{160M}{400M}$ = ~~0.99~~ 0.4 ⇒ $29.66

400M / 400M: 5555.56/(506.707 · .8) = 13.705

$\frac{13.705 + 8}{0.85}$ − 25.5 + 1 = $26.54

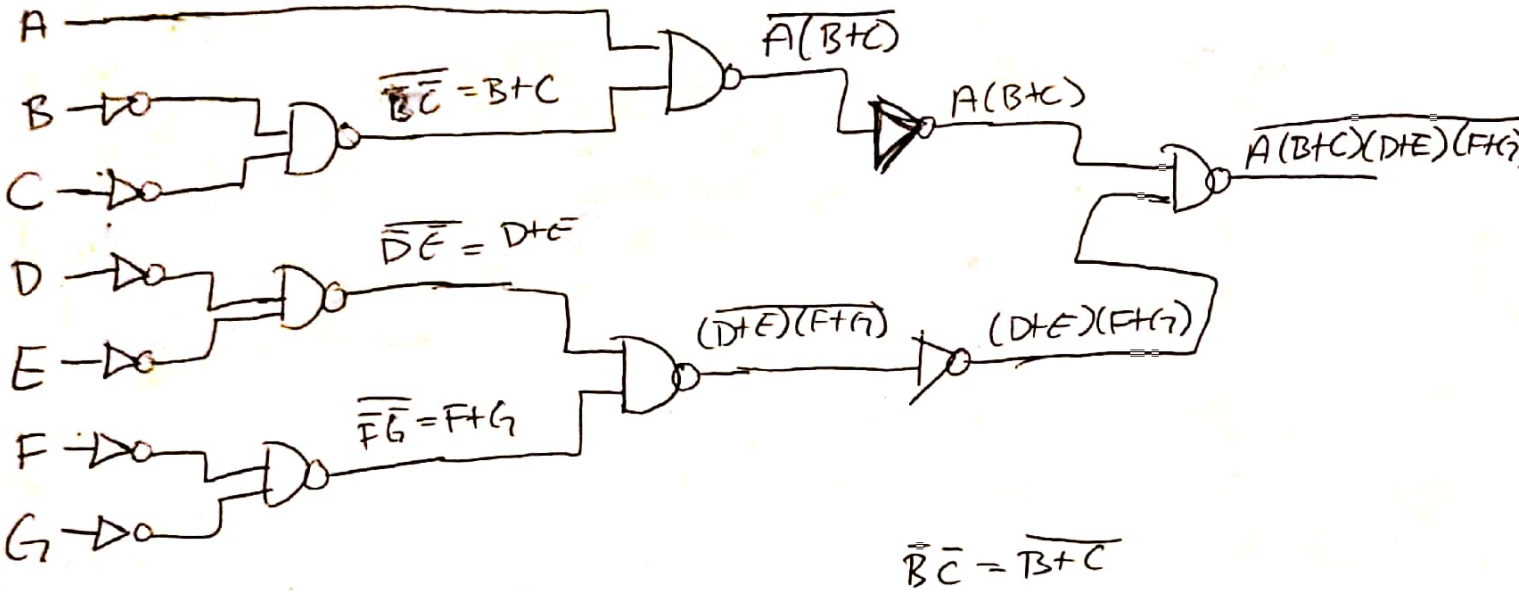
⇒ Strategy 2 will reduce the cost per IC because increasing the die yield by 15% means more die can be manufactured and sold, bringing down the total cost per IC. This strategy reduces the cost per IC by ≈$3

Scanned by CamScanner

Problem 2

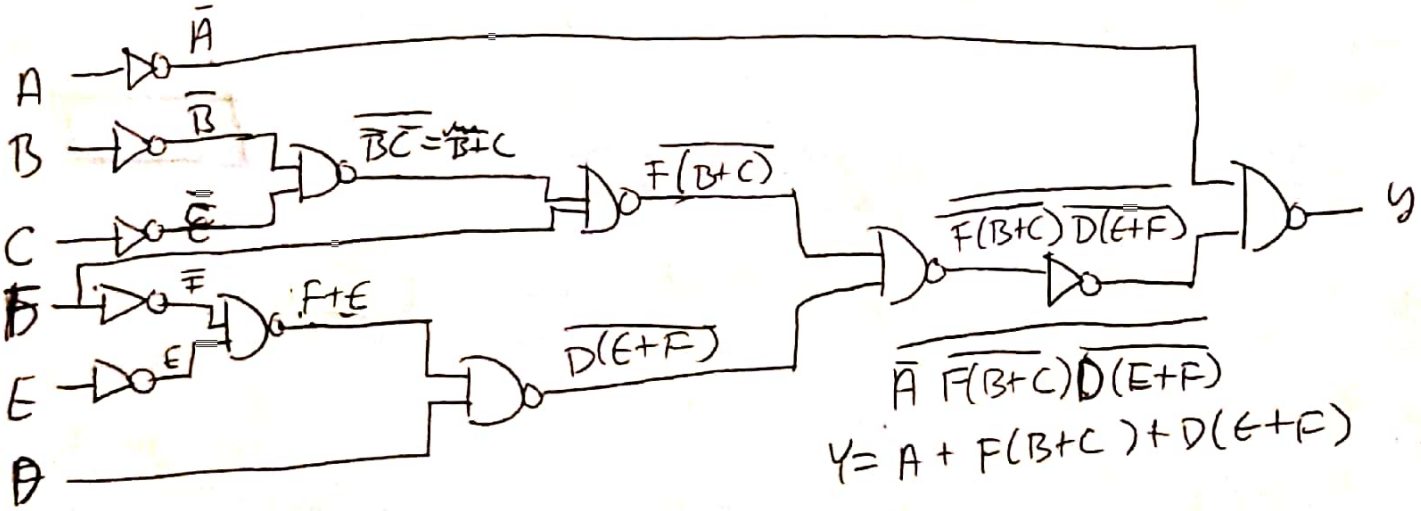
a) $Y = \overline{A \cdot (B+C)(D+E)(F+G)}$

$\overline{B+C} = \bar{B}\bar{C}$ $\quad \overline{D+E} = \bar{D}\bar{E}$ $\quad \overline{F+G} = \bar{F}\bar{G}$



$\bar{B}\bar{C} = \overline{B+C}$

b) $Y = A + \bar{F}(B+C) + \bar{D}(E+F)$



$\bar{A}\,\overline{F(B+C)}\,\overline{D(E+F)}$

$Y = A + F(B+C) + D(E+F)$

Scanned by CamScanner

Problem 3

$$\bar{F} = (A+B)\bar{C} + A\bar{B} + \bar{A}B$$

$$F = \overline{(A+B)\bar{C} + A\bar{B} + \bar{A}B}$$

$$\Rightarrow \boxed{F = (\overline{A\bar{B}}+C)(\bar{A}+B)(A+\bar{B})}$$

A	B	C	$\bar{A}$	$\bar{B}$	$\bar{C}$	$(A+B)\bar{C}$	$A\bar{B}$	$\bar{A}B$	$\bar{F}$	F
0	0	0	1	1	1	0	0	0	0	1
0	0	1	1	1	0	0	0	0	0	1
0	1	0	1	0	1	1	0	1	1	0
0	1	1	1	0	0	0	0	1	1	0
1	0	0	0	1	1	0	1	0	1	0
1	0	1	0	1	0	0	1	0	1	0
1	1	0	0	0	1	0	0	0	1	0
1	1	1	0	0	0	0	0	0	0	1

Scanned by CamScanner