Stat 423/523 Spring 2020 **Homework 9 Solution Key**

1.

a. $r(\alpha) = t_{\alpha/2,df} \times \sqrt{MSE} \times (1/2^{p-q}) \times \sqrt{\text{sum of the reciprocal } s \text{ of all sample sizes}}$
Note: $MSE = 42.72$, $df = 2$, $\alpha = 0.05$, $t_{\alpha/2,df} = t_{0.025,2} = 4.303$

b. $r(\alpha) = r(0.05) = 4.303 \times \sqrt{42.72} \times (1/2^2) \times \sqrt{\frac{1}{3}+\frac{1}{1}+\frac{1}{1}+\frac{1}{1}} = 12.84$

c. Defining relation: $I = ABC$
Note: $A = BC$ and $B = AC$

Fitted Effect	Sum of Effects Estimated	Significant? Enter YES or NO below.
8.125	$\alpha_2 + \gamma_{22}^{BC}$	*No*
−10.375	$\beta_2 + \gamma_{22}^{AC}$	*No*
17.175	$\delta_2 + \gamma_{22}^{AB}$	*Yes*

If **all** interactions are negligible, then factor C is the most important because $17.175 > r(\alpha)$.
Factors A and B are not important because their estimates $< r(\alpha)$.

2.

a. Avoid the design for generators that alias main effects with other main effects: confounding
b. Want that alias main effects with interactions (where higher order interactions are better).
Thus, design 2 is better.

3.

a. temperature (°C): independent variable
removal efficiency (%): dependent variable
b. Yes.
On average, y increases certain amount associated with +1 °C change in temperature..