Q3

Exercise 6 on page 564.

Source	df	Sum of squares	Mean square	f
Brand	$I-1$	SSTr	$\mathrm{MSTr} = \mathrm{SSTr}/(I-1)$	MSTr / MSE
Error	$I(J-1)$	SSE	$\mathrm{MSE} = \mathrm{SSE}/[I(J-1)]$	
Total	$IJ-1$	SST		

MSE = 14,713.69

SST = 310,500.76

Four brands are sparkplugs are tested $\implies I = 4$

Five of each brand are tested $\implies J = 5$

$$\mathrm{MSE} = \frac{\mathrm{SSE}}{I(J-1)} \implies \mathrm{SSE} = \mathrm{MSE}[I(J-1)] = 14,713.69 \cdot 4(5-1) = 235,419.04$$

$$\mathrm{SST} = \mathrm{SSTr} + \mathrm{SSE} \implies \mathrm{SSTr} = \mathrm{SST} - \mathrm{SSE} = 75,081.72$$

$$\mathrm{MSTr} = \frac{\mathrm{SSTr}}{I-1} = \frac{75,081.72}{4-1} = 25,027.24$$

$$f = \frac{MSTr}{MSE} = \frac{25,027.24}{14,713.69} = 1.7009$$

Source	df	Sum of squares	Mean square	f
Brand	3	75,081.72	25,027.24	1.7009
Error	16	235,419.04	14,713.69	
Total	19	310,500.76		

The null hypothesis is that all the spark plugs have the same mean performance, the alternative is that they are not all the same

$H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$

H_{a} : at least two of the μ_i's are different

P value for a signficance level of $\alpha = 0.01$ is $F_{\alpha, I-1, I(J-1) = F_{0.01,3,16}} = 5.2922$

$f > F_{0.01,3,16}$ so reject the null hypotheiss at this signifigance level.