**4.9**

**(a)**.

**General Linear Model: fuel versus oil, truck**

Method

Factor coding (-1, 0, +1)

Factor Information

Factor Type Levels Values

oil Random 3 1, 2, 3

truck Random 5 1, 2, 3, 4, 5

Analysis of Variance

Source DF Adj SS Adj MS F-Value P-Value

oil 2 0.006706 0.003353 6.35 0.022

truck 4 0.092100 0.023025 43.63 0.000

Error 8 0.004222 0.000528

Total 14 0.103028

Model Summary

S R-sq R-sq(adj) R-sq(pred)

0.0229735 95.90% 92.83% 85.59%

**(b).**

**Comparisons for fuel**

**Fisher Pairwise Comparisons: Response = fuel, Term = oil**

Grouping Information Using Fisher LSD Method and 95% Confidence

oil N Mean Grouping

2 5 0.5410 A

3 5 0.5012 B

1 5 0.4924 B

Means that do not share a letter are significantly different.

**Fisher Individual 95% CIs** ****

**(c).**



**4.21**

**General Linear Model: focus time versus distance, subject**

Method

Factor coding (-1, 0, +1)

Factor Information

Factor Type Levels Values

distance Random 4 4, 6, 8, 10

subject Random 5 1, 2, 3, 4, 5

Analysis of Variance

Source DF Adj SS Adj MS F-Value P-Value

distance 3 32.95 10.983 8.61 0.003

subject 4 36.30 9.075 7.12 0.004

Error 12 15.30 1.275

Total 19 84.55

Model Summary

S R-sq R-sq(adj) R-sq(pred)

1.12916 81.90% 71.35% 49.73%

**4.22**

**General Linear Model: reaction time versus batch, day, ingredient**

Method

Factor coding (-1, 0, +1)

Factor Information

Factor Type Levels Values

batch Random 5 1, 2, 3, 4, 5

day Random 5 1, 2, 3, 4, 5

ingredient Random 5 A, B, C, D, E

Analysis of Variance

Source DF Adj SS Adj MS F-Value P-Value

batch 4 15.44 3.860 1.23 0.348

day 4 12.24 3.060 0.98 0.455

ingredient 4 141.44 35.360 11.31 0.000

Error 12 37.52 3.127

Total 24 206.64

Model Summary

S R-sq R-sq(adj) R-sq(pred)

1.76824 81.84% 63.69% 21.19%

**4.40**

**General Linear Model: performance versus additive, car**

Method

Factor coding (-1, 0, +1)

Rows unused 5

Factor Information

Factor Type Levels Values

additive Random 5 1, 2, 3, 4, 5

car Random 5 1, 2, 3, 4, 5

Analysis of Variance

Source DF Adj SS Adj MS F-Value P-Value

additive 4 35.73 8.9333 9.81 0.001

car 4 35.23 8.8083 9.67 0.001

Error 11 10.02 0.9106

Total 19 76.95

Model Summary

S R-sq R-sq(adj) R-sq(pred)

0.954257 86.98% 77.52% 56.97%

**5.3**

**(a).**

**General Linear Model: reaction versus temperature, pressure**

Method

Factor coding (-1, 0, +1)

Factor Information

Factor Type Levels Values

temperature Fixed 3 150, 160, 170

pressure Fixed 3 200, 215, 230

Analysis of Variance

Source DF Adj SS Adj MS F-Value P-Value

temperature 2 0.30111 0.15056 8.55 0.004

pressure 2 0.76778 0.38389 21.80 0.000

Error 13 0.22889 0.01761

Lack-of-Fit 4 0.06889 0.01722 0.97 0.470

Pure Error 9 0.16000 0.01778

Total 17 1.29778

Model Summary

S R-sq R-sq(adj) R-sq(pred)

0.132691 82.36% 76.94% 66.19%

**(b).**



**(c).**



**5.10**

**(a).**

**General Linear Model: light output versus class type, temperature**

Method

Factor coding (-1, 0, +1)

Factor Information

Factor Type Levels Values

class type Fixed 3 1, 2, 3

temperature Fixed 3 100, 125, 150

Analysis of Variance

Source DF Adj SS Adj MS F-Value P-Value

class type 2 150865 75432 5.59 0.011

temperature 2 1970335 985167 72.94 0.000

Error 22 297131 13506

Lack-of-Fit 4 290552 72638 198.73 0.000

Pure Error 18 6579 366

Total 26 2418330

Model Summary

S R-sq R-sq(adj) R-sq(pred)

116.215 87.71% 85.48% 81.49%

Coefficients

Term Coef SE Coef T-Value P-Value VIF

Constant 940.19 3.68 255.53 0.000

class type

1 75.15 5.20 14.44 0.000 1.33

2 26.81 5.20 5.15 0.000 1.33

temperature

100 -373.85 5.20 -71.85 0.000 1.33

125 118.81 5.20 22.83 0.000 1.33

class type\*temperature

1 100 -68.81 7.36 -9.35 0.000 1.78

1 125 -46.81 7.36 -6.36 0.000 1.78

2 100 -40.15 7.36 -5.46 0.000 1.78

2 125 -50.81 7.36 -6.91 0.000 1.78

**(b).**



**(c).**



**5.12**

