1) Least Squares Estimator

$$\hat{\beta} = (X'X)^{-1} X'y \qquad n = 6$$

$$X = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 2 & 2 \\ 1 & 3 & 2 \\ 1 & 3 & 4 \end{bmatrix} \quad X' = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 2 & 3 & 3 \\ 1 & 1 & 2 & 2 & 4 \end{bmatrix} \cdot \quad y = \begin{bmatrix} 2 \\ 3 \\ 4 \\ 6 \\ 10 \end{bmatrix}$$

$X'y$

$$\begin{bmatrix} 2+3+4+6+10 \\ 2+3+8+18+30 \\ 2+3+8+12+40 \end{bmatrix} = \begin{bmatrix} 25 \\ 61 \\ 65 \end{bmatrix} \cdot \begin{bmatrix} 1.2 & -0.5 & 0 \\ -0.5 & .75 & -0.5 \\ 0 & -0.5 & 0.5 \end{bmatrix}$$

$$\begin{bmatrix} 30 - 30.5 + 0 \\ -12.5 + 45.75 - 32.5 \\ 0 - 30.5 + 32.5 \end{bmatrix} = \begin{bmatrix} -0.5 \\ .75 \\ 2 \end{bmatrix} = \begin{bmatrix} \hat{\beta}_0 \\ \hat{\beta}_1 \\ \hat{\beta}_2 \end{bmatrix} \qquad \boxed{\hat{\beta}' = E}$$

2) $(X'X)^{-1} X'y = \hat{\beta}$

$$X \begin{bmatrix} 1 & 1 & -1 \\ 1 & 1 & 0 \\ 1 & 2 & 0 \\ 1 & 0 & 2 \\ 1 & 0 & 0 \end{bmatrix} \quad X' = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 2 & 0 & 0 \\ 1 & 0 & 0 & 2 & 0 \end{bmatrix} \quad y = \begin{bmatrix} 2 \\ 3 \\ 4 \\ 6 \\ 10 \end{bmatrix} = \quad X'y \begin{bmatrix} 2+3+4+6+10 \\ 2+3+8+0+0 \\ 2+0+0+12+0 \end{bmatrix}$$

$$\begin{bmatrix}25\\13\\14\end{bmatrix}\cdot\begin{bmatrix}0.8285714 & -0.4857143 & -0.4\\ -0.4857143 & 0.4571429 & 0.2\\ -0.4 & 0.2 & 0.4\end{bmatrix}$$

$$\begin{bmatrix}20.7714285 & -6.3142859 & -5.6\end{bmatrix} = \begin{bmatrix}8.79\end{bmatrix} \quad \hat{B}_0 = 8.8$$

C

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3) $F = 20 \quad R^2 = ?$

$n = 105$

$p = 4$

$$R^2 = \frac{Fp}{Fp + n - p - 1} = R^2 = \frac{20(4)}{20(4) + 105 - 4 - 1} = .44$$

C

4. $$F = \frac{R^2/p}{(1-R^2)/(n-p-1)}$$

$R^2 = .8$

$n = 20$

$p = 4$

$$F = \frac{.8/4}{(1-.8)/(20-4-1)} = 15$$

D

5. $$F = \frac{(RSS_0 - RSS_1)/q}{RSS_1/(n-p-1)}$$

$q = 3$

$p = 5$

$n = 18$

$RSS_0 = 102$

$RSS_1 = 78$

$$\frac{(102-78)/3}{78/(18-5-1)} = 1.23 =$$ A

6. $\dfrac{(R_F^2 - R_R^2)/q}{(1-R_F^2)/(n-p-1)}$

$R_F^2 = .94 \quad n = 42 \quad q = 2$

$R_R^2 = .915 \quad p = 4$

$$\frac{(.94-.915)/2}{(1-.94)/(42-4-1)} = 7.7 = \boxed{C}$$

7. F-ratio =

$$\frac{(27.7281-12.8156)/2}{12.8156/7}$$

$= 4.07$

$\boxed{D}$

$RSS_0 = 27.7281 \quad q =$

$RSS_1 = 12.8156$

$DF_{full} = 7 \quad DF_{diff} = 2$

$DF_{red.} = 9$

8. $\boxed{C}$ III p-value $> .05$

$.5649$ = not significant