(i) $b \pm t_{.025}(10) \frac{s}{\sqrt{S_{xx}}}$

$-1.686 \pm 2.228 \frac{\sqrt{2.68845}}{\sqrt{43.0467}}$

$-1.686 \pm 1.557$

$-1.243 < \beta < -1.129$

$\alpha \pm 2.228 \sqrt{\frac{\sum x^2}{n S_{xx}}}$

$42.58 \pm 2.228 \sqrt{\frac{2.68845}{\sqrt{81.34.26}}}$

$42.58 \pm 14.5$

$28.08 < \alpha < 57.08$

(ii) $H_0: \beta = 0$

$H_1: \beta \neq 0$

$2. \alpha = .05$

3. Test Statistic: $t = \frac{b}{s/\sqrt{S_{xx}}} \sim t(n-2)$

4. Reject $H_0$ if $|t| > t_{.025}(10)$

$|t| > 2.228$
5. \[ t = \frac{b}{S_{b}} = \frac{-1.6860}{\sqrt{2.68845}/\sqrt{43.0467}} \]
\[ = -\frac{1.6860}{1.2499} \]
\[ = -1.345 \]

6. Since \(|-1.345| > 2.228\), we reject \(H_0\).

7. There seems to be a (negative) linear relationship between stress and resistance.

\[ 2(0.01) < P < 2(0.015) \]
\[ 1.02 < P < 0.03 \]

which is consistent with \(P=0.0206\) given by SAS.

(iii) \[ \hat{Y}_0 = -1.686(25)+42.58 \]
\[ = 25.43 \]

Note: \(\bar{x} = 25.967\)

\[ 25.43 \pm 2.228 \sqrt{2.68845} \sqrt{1 + \frac{(25-25.967)^2}{43.0467}} \]
\[ 25 \pm 1.18 \]

i.e. \[ 23.82 < \mu < 26.18 \]

(iv) \[ 25.43 \pm 2.728 \sqrt{2.68845} \sqrt{1 + \frac{1}{12} + \frac{(25-25.967)^2}{43.0467}} \]
\[ 25 \pm 3.84 \]

i.e. \[ 21.16 < Y_0 < 28.84 \]
Plot of scale*pressure. Legend: A = 1 obs, B = 2 obs, etc.

SAS plot

1. Note: It looks "funny" since there are only 2 distinct values of X.
2. I have included the SAS file that gave this plot on the next page. Note the "lp" on the proc reg command line. Unless this is included, SAS will not print the plot.
filename f1 'ex8p360.data';
Data one;
   infile f1;
   input pressure scale;
proc reg data=one lp;
   model scale=pressure;
   Title 'Exercise 8, page 360';
proc plot;
   plot scale*pressure;
proc means;
run;
Exercise 8, page 360
15:28 Monday, February 17, 2003

The REG Procedure
Model: MODEL1
Dependent Variable: scale

Analysis of Variance

<table>
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<tr>
<th>Source</th>
<th>DF</th>
<th>Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
<th>Pr &gt; F</th>
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<td>13154</td>
<td></td>
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</tr>
</tbody>
</table>

Root MSE        | 2.50000 |
Dependent Mean  | 52.60000 |
Coeff Var       | 4.75285  |

Parameter Estimates

| Variable | DF | Parameter Estimate | Standard Error | t Value | Pr > |t| |
|----------|----|--------------------|----------------|---------|------|---|
| Intercept| 1  | -1.70000           | 1.42522        | -1.19   | 0.2671 |
| pressure | 1  | 1.81000            | 0.03953        | 45.79   | <.0001 |

(c) \( \hat{y} = -1.7 + 1.81x \)
\( x = \) pressure
\( y = \) scale

(d) (i) Yes, since p-value < .0001 (i.e. it is less than .05)
(See *)
(ii) We would reject Ho if \( F > f_{0.05}(1, 8) \), i.e. \( F > 5.32 \)
(iii) See above