Stat763 HW08

1. With data in table 8.1 on p270 and in file Table8-1.txt, the life for tool A and the life of tool B are believed to be $y_A = \beta_0 + \beta_{A1}x + \epsilon$ and $y_B = \beta_0 + \beta_{B1}x + \epsilon$ where two regression lines share the intercepts.

   (1) In order to test $H_0 : \beta_{A1} = \beta_{B1}$ define a combined model and write out the hypothesis to be tested.

   Let IA be the indicator for tool A. For model

   $$y = \beta_0 + \beta_1 x + \beta_2 IA * x + \epsilon$$

   we need to test $H_0 : \beta_2 = 0$ versus $H_a : \beta_2 \neq 0$.

   (2) Write the SAS code including data step for the test.

```
data a;
  infile "D:\Table8-1.txt";
  input y x T $;
  if T="A" then IA=1;
  if T="B" then IA=0;
  IAx=IA*x;
```

```
proc reg;
  model  y=x IAx/noprint;
  test IAx;
  run;
```

2. 7.21 p258
   Consider polynomial regression model, $y = \beta_0 + \beta_1 x + \beta_2 x^2 + \epsilon$ with data in 7-21data.txt.

   (1) For the first test in (c), the F-test on the significance of the contribution of the quadratic term, write the SAS code including data step.

```
data a;
  infile "D:\7-21data.txt";
  input y x @@;
  x2=x*x;
```

```
proc reg;
  model y=x x2/noprint;
  test x2;
  run;
```

   (2) Write your report based on SAS output.

$H_0 : \beta_2 = 0$ versus $H_a : \beta_2 \neq 0$
Test statistic: $F = \frac{SSI_2}{MSE}$
p-value: $P(F(1, n-3) > F_{ob})$

$F_{ob} = 55.01$
p-value: $P(F(1, 7) > 55.01) = 0.0001$
Reject H_0.
The contribution of quadratic term is significant.

3. 4.19 p173
Observations on x_1, x_2, x_3 and y are stored in 4-19data.txt. 9 levels of (x_1, x_2, x_3): $(-1, -1, 1)$, $(1, -1, -1)$, $(-1, 1, -1)$,$(1, 1, 1)$, $(-1, -1, -1)$, $(1, -1, 1)$, $(-1, 1, 1)$, $(1, 1, -1)$ and $(0, 0, 0)$ define 9 populations.

(1) For ANOVA $y = \mu(x_1, x_2, x_3) + \epsilon$, calculate SSPE and its DF.

$SSPE = \sum_{i=1}^{9} CSS_i = 126.8333$ and DF $= 14 - 9 = 5$

(2) The following SAS will produce ANOVA table where you can find SSPE and its DF. Run SAS to verify your computation in (1).

```
data a;
  infile "D:\4-19data.txt";
  input x1 x2 x3 y;
  x=100*x1+10*x2+x3;
```

```
proc anova;
  class x;
  model y=x;
  run;
```

SSPE= 126.83; DF= 5