Part I:

Problem 1) The experimental design used here is a split plot design. At the primary level, the experimental unit is the pond – this is the “whole plot” level. At the secondary level, the experimental unit is the individual egg sample measurement – this is the “split plot”.

Problem 2) mod1 = aov(sodium~species\*depth\*season + Error(pond/species/depth/season), data = fisheggs)

Error: pond Error: pond:species

Df Sum Sq Mean Sq Df Sum Sq Mean Sq

species 1 6412 6412 species 1 241.5 241.5

Error: pond:species:depth Error: pond:species:depth:season

Df Sum Sq Mean Sq Df Sum Sq Mean Sq

depth 1 83.65 83.65 season 2 609.5 304.75

depth:season 2 5.6 2.81

Error: Within

Df Sum Sq Mean Sq F value Pr(>F)

species 1 30.7 30.7 0.297 0.593

depth 1 12.3 12.3 0.119 0.735

season 2 759.9 379.9 3.681 0.047 \*

species:depth 1 6.2 6.2 0.060 0.809

species:season 2 224.9 112.4 1.089 0.359

depth:season 2 6.4 3.2 0.031 0.970

species:depth:season 2 61.6 30.8 0.298 0.746

Residuals 17 1754.7 103.2

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Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Problem 3)



Problem 4)

Problem 5)

Part II:

#Molly Jenkins

#Molly Jenkins

#Assignment 5

#ENEC563

#02/27/2017

#

# 1) Explain the experimental design that was used here.

# Clearly identify the different kinds of experimental units and treatments using the language that is appropriate for this design.

#

# 2) Analyze the manner in which species, depth, and season affected the sodium content of fish eggs using a linear mixed model.

#

# 3) Prepare a graph that summarizes the results of your analysis.

#

# 4) Assume that the three values of the season variable are equally spaced in time.

# Refit your final model from question 2 but this time treat season as a continuous variable with equally spaced values.

# Superimpose your final continuous season model on the graph of Question 3.

#

# 5) Interpret your final model of Question 4.

# In terms of this model how does the sodium content of the eggs of the two species differ?

# Give both a qualitative and a quantitative answer.

#setwd("C:/git/coursework/ENEC563/")

library(ggplot2)

library(dplyr)

library(gridExtra)

fisheggs = read.table('https://sakai.unc.edu/access/content/group/7d7a0e1c-4adb-4ee2-ace8-490a89313a59/Data/fisheggs.txt', header = TRUE)

####Problem 1####

#This is a split-plot design

table(fisheggs$species, fisheggs$depth, fisheggs$season)

#nicely balanced

####Problem 2####

sink("A5\_table1.txt")

mod1 = aov(sodium~species\*depth\*season + Error(pond/species/depth/season), data = fisheggs) #structured error term

summary(mod1)

sink()

####Problem 3####

intplot = ggplot(fisheggs,aes(y=sodium))

plot1 = intplot+stat\_summary(aes(x=species,linetype=depth,group=depth),geom="line"

,fun.y="mean")+labs(title=expression("species"%\*%"depth interaction"))

plot2 = intplot+stat\_summary(aes(x=species,linetype=season,group=season),geom="line"

,fun.y="mean")+labs(title=expression("species"%\*%"season interaction"))

plot3 = intplot+stat\_summary(aes(x=depth,linetype=season,group=season),geom="line"

,fun.y="mean")+labs(title=expression("depth"%\*%"season interaction"))

triplot = grid.arrange(plot1, plot2, plot3, nrow=3)

####Problem 4####

# Refit your final model from question 2 but this time treat season as a continuous variable with equally spaced values.

# Superimpose your final continuous season model on the graph of Question 3.

mod2 = aov(sodium~species\*depth\*season + Error(pond/species/depth/season), data = fisheggs)

####Problem 5####