Stat 401 Minitab 17 Project 4

The following instructions are for Minitab 17. The commands and menu selections for Minitab 15, Minitab 16 and Mintab Express should be similar. (If there are differences, I suggest you use the Help menu, or Internet search, to help figure things out.)

Purpose: I. To use MINITAB to conduct a single-factor ANOVA.
    II. To use MINITAB to conduct a multiple-comparison ANOVA.
    III. To use MINITAB to conduct a single-factor ANOVA with differing sample sizes.

Reading: Text, Chapter 10 on Analysis of Variance.

Turn in: A. Print outs of the session windows for each of the three hypothesis tests.
    B. The answers to the questions as indicated below.

General Instructions: What follow are the Minitab commands for conducting an analysis of variance. Words in capital letters followed by the symbol > indicate a sequence of menu items to be selected/clicked.

I. Single-Factor ANOVA – Text homework exercise #8 (9th and 8th editions)

A. Begin by opening Minitab. Type the title "stiffness" in the box below C1 and type the title "lengths" in the box below C2.
    Next, open the Excel spreadsheet file "Stat401 MINITAB 17 Project 4 data I".
    Highlight and copy the numbers in columns A and B, rows 1 through 35.
    In Minitab, paste the entries into columns C1 and C2.

You are going to use Minitab to conduct the ANOVA of this text homework exercise.
We are going to assume that the assertion of a normal population distribution is justified.

STAT > ANOVA > ONE WAY …
The pull-down menu to the upper right should say "Response data are in one column for all factor levels".
For the "Response" dialog box highlight then select the dependent variable.
For the "Factor" dialog box highlight then select the dependent variable.
Click on the "Options…" button.
Set the appropriate"Confidence level:".
Leave "Type of confidence interval:" set at Two-sided.
Click on the "OK" button in the "Options…" dialog box.
Click on the "Comparisons…" button.
Check the "Tests" box.
Click on the "OK" button in the "One-Way Analysis of Variance" dialog box.
Note: The outputs you print out and turn in for parts I, II and III will only include the session window.
Do not include the graphs.

B. Answer the following.
   1. State the null and alternate hypotheses.
   2. State the sample means for each of the independent variables.
   3. Create and fill in all of the appropriate values in an ANOVA Table.
   4. State the value of the hypothesis test statistic found by Minitab.
   5. State the *p*-value found by Minitab.
   6. State whether this *p*-value would indicate "reject the null hypothesis" or "fail to reject the null hypothesis" at the given level of significance.
   7. State a conclusion in words, in the context of the given situation.

II. Multiple-Comparison ANOVA – Text homework exercise #18 (9th and 8th editions)

A. Either clear the previous entries in Minitab, or open a new Minitab worksheet.
   Type the titles 1, 2, 3, 4 and 5 in the boxes below C1 through C5 respectively, then enter the 4 corresponding data values in each appropriate column. (The numbers should be right-justified, indicating that they are being recognized as numeric data.)

You are going to use Minitab to conduct the ANOVA and Tukey test of this text homework exercise.
We are going to assume that the assertion of normal population distributions is justified.

The instructions are the same as those in part I, with two differences.
In the "One-Way Analysis of Variance" dialog box, the pull-down menu to the upper right should say
   "Response data are in a separate column for each factor level". Then, after clicking in the "Responses:"
   dialog box, highlight C1 through C5, then click on "Select".
In the "Comparisons…" dialog box, check both the "Tukey" and the "Tests" boxes.

B. Answer the following.
   1. State the null and alternate hypotheses.
   2. State the sample means for each of the independent variables.
   3. Create and fill in all of the appropriate values in an ANOVA Table.
   4. State the value of the ANOVA hypothesis test statistic found by Minitab.
   5. State the ANOVA p-value found by Minitab.
   6. State whether thisANOVA p-value would indicate "reject the null hypothesis" or "fail to reject the null hypothesis" at the given level of significance.
   7. State a conclusion for the ANOVA in words, in the context of the given situation.
   8. Conduct the T method analysis to determine any significant differences.
      a. Write the 5 sample means in increasing order.
      b. Use the Minitab grouping information to determine whether each pairwise comparison indicates a significant difference, and underline (or not) as appropriate.
   9. Answer the text's question, "What happens when Tukey's procedure is applied?"

III. Single-Factor ANOVA with differing sample sizes – Text homework exercise #22 (9th and 8th editions)

A. Either clear the previous entries in Minitab, or open a new Minitab worksheet.
   Type the titles 1.6, 3.8, 6.0 and 10.2 in the boxes below C1 through C4 respectively, then enter the corresponding data values in each appropriate column. (The numbers should be right-justified, indicating that they are being recognized as numeric data.)

You are going to use Minitab to conduct the ANOVA of this text homework exercise, and in addition conduct the Tukey test.
We are going to assume that the assertion of normal population distributions is justified.

The instructions are the same as those in part II.

B. Answer the following.
   1. State the null and alternate hypotheses.
   2. State the sample means for each of the independent variables.
   3. Create and fill in all of the appropriate values in an ANOVA Table.
   4. State the value of the ANOVA hypothesis test statistic found by Minitab.
   5. State the ANOVA p-value found by Minitab.
   6. State whether thisANOVA p-value would indicate "reject the null hypothesis" or "fail to reject the null hypothesis" at the given level of significance.
   7. State a conclusion for the ANOVA in words, in the context of the given situation.
   8. Conduct the T method analysis to determine any significant differences by writing the sample means in increasing order, and underlining (or not) as appropriate.
   9. State an appropriate conclusion to Tukey's procedure.