

PRINCE SULTAN UNIVERSITY
Department of Mathematical Sciences
Final Examination (081)
Spring Semester 2009
STAT 271

Student name			
Student ID		Section No.	
Name of Teacher	Dr. Quazi Abdus Samad		

Time allowed: **120 Minutes**

Write down your answer in the space provided underneath the question.

Numbers are given in the brackets.

You may use a programmable calculator and/or the formula sheet.

Question(s)	Maximum Points	Points obtained
1	16	
2	16	
3	16	
4	16	
5	16	
Total	80	

Question 1. (16 points) The public relations officer for a particular city claims the average monthly cost for childcare outside the home for a single child is \$600. A potential resident is interested in whether the claim is correct. She obtains a random sample of 14 records and computes the average monthly cost of this type of childcare to be \$589 with a standard deviation of \$40.

- State the null and alternative hypotheses for the test (2 points)
- Perform the small sample test of hypothesis at 5% level of significance (6 points)
- Mention the critical value of the test and interpret your result (2 points)
- Find the 95% confidence interval for the sample mean and comment on your result (6 points)

Question 2. (16 points) An airline company would like to know if the average number of passengers on a flight in November is less than the average number of passengers on a flight in December. The results of random sampling are printed below. Test the appropriate hypotheses using $\alpha = 0.01$.

November $n_1 = 85$ $\bar{x}_1 = 486$ $s_1 = 11$

December $n_2 = 90$ $\bar{x}_2 = 492$ $s_2 = 9$

- a. State the null and alternative hypotheses (2 points)
- b. Obtain the value of the test statistic (5 points)
- c. Mention the critical value of the test (3 points)
- d. Interpret the result (2 points)
- e. Find the 99% confidence interval for the difference of the two means and comment on the result (4 points)

<u>Sample 1</u>	<u>Sample 2</u>	<u>Sample 3</u>
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- Construct an ANOVA table for the data. **Show the values of SST, SSE, Total SS, CM, DF and F** (6 points)
- State the null and alternative hypotheses for an analysis of variance F test (2 points)
- State the critical value of the test to determine whether there is a difference in the three population means at 5% level of significance and interpret your results (4 points)
- Do the data provide sufficient evidence to indicate a difference between μ_2 and μ_3 ? Test using the t test with $\alpha = 0.05$ (4 points)

Question 4. (16 points) The following data were obtained in an experiment relating the dependent variable, y (texture of strawberries), with x (coded storage temperature).

X	-2	-2	0	2	2
Y	4	3.5	2	0.5	0

- Estimate the regression line of Y on X using the above data (4 points)
- Plot the data points and graph the least squares line and comment on it (2 points)
- Construct the ANOVA table (show the values of **DF , SSR , SSE , and F**) (5 points)
- Show whether the slope parameter b is statistically significant using the t test at 5% level of significance (mention the null and alternative hypotheses) (3 points)
- Do the F test and the t test lead you to the same conclusion? Justify your answer (2 points)

Question 5. (16 points) A survey of 400 respondents produced these cell counts in a 2X3 contingency table:

	Columns			
Rows	1	2	3	Total
1	37	32	95	164
2	60	63	113	236
Total	97	95	208	400

- a. Find the value of the test statistic to test whether the rows and columns are independent.
Show all the steps (10 points)
- b. State the rejection region for $\alpha = 0.01$ (2 points)
- c. State the null and alternative hypotheses in this context (2 points)
- d. Interpret the result (2 points)