PRINCE SULTAN UNIVERSITY
Department of Mathematical Sciences
Final Examination (091)
Spring Semester 2009-10
STAT 271

Student name			06-02-10
Student ID		Section No.	
Name of Teacher	Dr. Quazi Abdus Samad		

Time allowed: **150 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] A cable company in Michigan is thinking of offering its service in one of two counties; Mecosta and Newaygo. Allegedly, the proportion of households in either county is ready to connect to the cable, but the company wants to test the claim. Accordingly, it takes a simple random sample in each county. In Mecosta county, 175 of 200 households say they will join. In Newaygo county, 665 of 800 households say so.

a. [2 points] State the appropriate null and alternative hypotheses

b. [2 points] Calculate the pooled estimate of the common proportion *p*

c. [2 points] Calculate the standard error of $\hat{p}_1 - \hat{p}_2$

d. [4 points] Calculate the value of the test statistic

e. [2 points] Calculate the *p* – value and write your conclusion given that α = .05

f. [2 points] Construct 95% confidence interval for the difference in proportions of households in Mecosta and Newaygo counties who are ready to connect to the cable

g. [2 points] Do you arrive at the same conclusion as in **e** above?

Question 2 [16 points] The manager of an ice cream store is interested in examining the relationship between sales of ice cream (in gallons per day) and maximum temperature of the day. The vendor records the following data for a random sample of seven days in the summer, where *y* is number of gallons of ice cream sold per day and *x* is maximum temperature, in degrees Fahrenheit, recorded for the day:

X	85	90	95	87	80	88	92
Y	5	7.5	10	6	4.3	5.5	9

a. [3 points] Find the least-squares regression line

b. [2 points] Find the estimated sales of ice cream for a maximum daily temperature of 93°

c. [2 points] Find and interpret the coefficient of determination

d. [5 points] Test $H_0 : \beta = 0$ vs. $H_a : \beta \neq 0$ at the 0.05 level of significance

e. [4 points] Find the 95% confidence interval for the slope parameter, β

Question 3 [16 points] The data shown below are collected using randomized design. The data values represent the number of days absent from work for 3 independent samples of workers.

Sample 1	Sample 2	Sample 3
4	5	3
3	4	1
5	6	3
4	3	2
3	6	

a. [2 points] Calculate CM and Total SS

b. [2 points] Calculate SST and MST

c. [2 points] Calculate SSE and MSE

d. [2 points] Construct a complete ANOVA table for the data

e. [2 points] State the null and alternative hypotheses for an analysis of variance *F* test

f. [2 points] Use the *p*-value approach **<u>or</u>** critical value approach to determine whether there is a difference in the three population means. Use $\alpha = 0.05$

h. [4 points] Find a 90% confidence interval for the difference ($\mu_1 - \mu_3$) and interpret the result

Question 4 [16 points] The owner of Fit Forever Health Club is considering adding an indoor swimming pool to his facility. The manager decided to take a survey to determine whether member opinion about the addition of a pool was independent of the age of the member. Two hundred members were selected at random and asked to state their opinion. The following data was recorded:

	Opinion Concerning Pool		
Age	Favor	Undecided	Oppose
Under 30	40	20	18
30 but under 50	30	25	20
Over 50	10	16	21

a. [2 points] State the null and alternative hypotheses

b. [4 points] Find all the expected frequencies [**show the formula**]

c. [6 points] What is the value of the test statistic? [**show the formula**]

d. [2] What is the critical value associated with the test at 5% level of significance?

e. [2] What is the appropriate conclusion?

Question 5 [16 points] A vendor was interested in determining whether two soft drink machines dispense the same amount of liquid. A sample of size seven was selected from each machine and the amount of liquid dispensed (in ounces) was recorded as follows:

Machine A	Machine B
10.1	10.0
11.0	9.0
9.8	8.5
10.2	11.1
10.3	10.5
9.9	9.6
10.4	9.7

Use the **Wilcoxon rank sum test** to determine whether the distributions for the amount of liquid dispensed are the same for both machines. Use $\alpha = 0.05$.

a. [2 points] State the null and alternative hypotheses

b. [4 points] Find the value of the test statistic using the ranks (**show the ranks in brackets in the data table**)

c. [2 points] Mention the rejection region

d. [2 points] State your conclusion

e. [6 points] Also use the normal approximation and write your conclusion