PRINCE SULTAN UNIVERSITY
Department of Mathematical Sciences
First Mid-Term Examination
First Semester (2007–2008)
STAT 271

Student Name:			
Student Number:		Section Number:	
Teacher Name:		Attendance Number:	

Mark
____
20

- Time allowed is 1½ hours.
- Write down your answer in the space provided underneath the question.
- Numbers within brackets [#] are the marks.
- You may use a programmable calculator and/or the attached formula sheet.

$Z_{0.10}$	$Z_{0.05}$	$Z_{0.025}$	$Z_{0.01}$	$Z_{0.005}$
1.285	1.645	1.96	2.325	2.575

Question 1:

A machine manufactures a part for a car engine. Suppose that we need to estimate the true proportion of defectives produced by this machine (p) by the sample proportion ($\hat{p}$).

(a) Determine the sample size (n) if we wish to be 95% confident that the error of estimation will not exceed 0.015. [1]

(b) If it is known that $0.02 \le p \le 0.06$, determine the sample size(n) if we wish to be 95% confident that the error of estimation will not exceed 0.015. [2]

Question 2:

A machine which manufactures a part for a car engine was observed over a period of time before a random sample of 150 parts was selected from those produced by this machine. Out of the 150 parts, 9 were defective. Suppose that the true proportion of defectives produced by the machine is p =0.05. Let $\hat{p}$ be the sample proportion.

(a) What is the mean of $\hat{p}$? [1]

(b) What is the standard error of $\hat{p}$? [2]

(c) What is the approximated distribution of $\hat{p}$? [1]

(d) What is the probability that the sample proportion will lie within 0.02 of the true population proportion of defective parts? [2]

(e) Find the sample proportion of defective parts in the sample, $\hat{p}$. [1]

Question 3:

In Question No. 2, suppose that the true proportion of defectives produced by the machine, p , is not known.

(a) Find a "good" point estimate for p . [1]

(b) Find the 95% margin of errors for estimating p by $\hat{p}$. [1]

(c) Find a 90% confidence interval for p . [2]

Question 4:

The annual incomes of two independent random samples of high school teachers from two countries yielded the following tabulation:

	Country 1	Country 2
Number of teachers (sample size)	$n_1 = 95$	$n_2 = 65$
Average income	$\overline{X}_1 = 28500$	$\overline{X}_2 = 27200$
Standard deviation	$S_1 = 1500$	$S_2 = 1000$

Suppose that μ_1 is the mean annual income of high school teachers in country 1, and μ_2 is the mean annual income of high school teachers in country 2.

(a) Find a "good" point estimate for $\mu_1 - \mu_2$. [2]

(b) Construct a 99% confidence interval for $\mu_1 - \mu_2$. [2]

(c) Using the result of part (b), would you be willing to conclude that these two country schools belong to populations having the same mean annual income? Explain. [2]