KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS & STATISTICS
Term 171
STAT 213 Exam #2

Name: _____ ID #: _____

- State all assumptions needed, otherwise you lose marks
- Show all details.
- If there is a rule you are using, write down that rule.
- For testing problems if α is not specified, use α=5%.
- Answers without justification are not accepted.

Question	Maximum Marks	Marks Obtained
1	7	
2	5	
3	10	
4	8	
5	6	
6	5	
7	2	
8	2	
Bonus	5	
Total	45	

1) An analysis of the amount of interest rate paid monthly by a bank's credit cardholders reveals that the amount is normally distributed with a mean of SR27 and a standard deviation of SR7.
   a) What proportion of the bank's cardholders pays between SR30 and SR40 in interest?
   (4marks)

   b) What interest payment is exceeded by only 15% of the bank's credit cardholders?
   (3marks)

2) Company ABC brand has a market share of 20%. Suppose that in a survey 1000 customers of the product are asked which brand they prefer. Find the probability that more than 22% of the respondents say they prefer company ABC brand. *(6marks)*

3) In a study of changing online spending habits from last year to this year, the following data were recorded

Shopper	Current Year Spending (SR)	Last Year Spending (SR)
1	405	334
2	125	150
3	540	520
4	100	95
5	200	212

a) Construct a 90% confidence interval for the difference in spending. *(5marks)*

b) Is there evidence that online shopping spending increased? *(5marks)*

4) A local delivery service advertises that its mean delivery time is less than 7 hours. A random sample of 12 deliveries gave a mean of 6.4 hours and a standard deviation of 1.8 hours.
   a) Find a 99% confidence interval for the mean delivery time. *(3marks)*

   b) At the 5% significance level, is there sufficient evidence to support the delivery service advertisement? *(5marks)*

5) $X_1, \cdots, X_n$ is a sample of size n from a standard normal distribution.
   a) If *n=16,* find $P(|\bar{X}| \leq 0.5)$. *(3marks)*

   b) What is the smallest value of *n* for which $P(|\bar{X}| \leq 0.5) \geq 0.99$? *(2marks)*

6) Consider the function $f(x) = \begin{cases} k\sqrt{x}, & 0 < x < 1 \\ 0, & otherwise \end{cases}$.

a) Find the value of *k* that will make *f(x)* a density function. *(2marks)*

b) Find *F(x)* and use it to evaluate $P(0.3 < X < 0.6)$ *(3marks)*

7) Consider the random variable *X* with pdf $f(x) = \begin{cases} \frac{\alpha\theta^{\alpha}}{x^{\alpha+1}}, & \alpha > 0, \theta > 0 \ \ x \geq \theta \\ 0, & otherwise \end{cases}$. Find the mean of *X*. *(2marks)*

8) If *T* is an exponential random variable with parameter λ, evaluate $\frac{f(t)}{1-F(t)}$. *(2marks)*

Bonus Question: *(5marks)*

If *T* is a non-negative random variable with density *f(t),* and cdf *F(t).* Show that

$$\mu = \int_0^\infty tf(t)dt = \int_0^\infty [1 - F(t)]\, dt$$