Prince Sultan University

Deanship of Educational Services
Department of Mathematics
and General Sciences

COURSE DETAILS:

Statistics and Probability Theory	STAT 271	Major 1
Semester:	Fall Semester --Term 181	
Date:	October 14, 2018	
Time Allowed:	**90 minutes**	

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section/Time	
Instructor's Name:	Dr. Eric Benson

INSTRUCTIONS:

- You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.
- NO talking or looking around during the examination.
- NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
- Show all your work and be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.

GRADING:

	Page 2	Page 3	Page 4	Page 5	Page 6	Total
Questions	**20**	**16**	**14**	**20**	**10**	**80**
Marks						

20 points

1. A medical research team conducted a study to test the effect of a cholesterol-reducing medication. At the end of the study, the researchers found that of the 4700 randomly selected subjects who took the medication, 301 died of heart disease. Of the 4300 randomly selected subjects who took a placebo, 357 died of heart disease.
   a. At $\alpha = 0.10$ can you support the claim that the death rate due to heart disease is lower for those who took the medication than for those who took the placebo? **(10 points)**

   b. Find the p-value of this test. **(5 points)**

   c. Construct a 90% confidence interval for the difference in the population proportions. **(5 points)**

16 points

2. The deflection temperature under load for two different types of plastic pipe is being investigated. Two random samples of 15 pipe specimens are tested, and the deflection temperatures observed are reported here (in ^{0}F): Population variances are not equal.

Type 1			Type 2		
206	193	192	177	176	198
188	207	210	197	185	188
205	185	194	206	200	189
187	189	178	201	197	203
194	213	205	180	192	192

Do the data support the claim that the deflection temperature under load for type 1 pipe exceeds that of type 2? In reaching your conclusions, use **Traditiona**l and a **P-value** in answering this question. Use $\alpha = 0.05$

14 points

3. Suppose the food label on a cookie bag states that there is at most 2 grams of saturated fat in a single cookie. Assume the actual mean amount of saturated fat per cookie is 2.09 grams, and the population standard deviation is 0.25 grams. At $\alpha = 0.05$ significance level, what is the probability of having type II error for a sample size of 35 cookies? What is the power of this test? Interpret the **power**.

20 points

4. **Tensile Strength** The tensile strength of a metal is a measure of its ability to resist tearing when it is pulled lengthwise. A new experimental type of treatment produced steel bars with the following tensile strengths (in newtons per square millimeter).

Experimental Method:

391	383	333	378	368
401	339	376	366	348

The old method produced steel bars with the following tensile strengths (in newtons per square millimeter).

Old Method:

362	382	368	398	381	391	400
410	396	411	385	385	395	

a. At $\alpha = 0.05$ does the new treatment make a difference in the tensile strength of steel bars? Assume the population variances are equal. **(15 points)**

b. Find the 95% confidence interval for the difference in the mean tensile strength for the two method. **(5 points)**

10 points

5. A shoe manufacturer claims that athletes can increase their vertical jump heights using the manufacturer's new Strength Shoes®. The vertical jump heights of eight randomly selected athletes are measured. After the athletes have used the Strength Shoes® for 8 months, their vertical jump heights are measured again. The vertical jump heights (in inches) for each athlete are shown in the table. At $\alpha = 0.10$ is there enough evidence to support the manufacturer's claim? Assume the vertical jump heights are normally distributed.

Athlete	1	2	3	4	5	6	7	8
Vertical jump height (before using shoes)	24	22	25	28	35	32	30	27
Vertical jump height (after using shoes)	26	25	25	29	33	34	35	30