

Elizade University
Faculty of Social and Management Sciences
Department of Economics

Second Semester 2018/2019 Examination

Course Code: ECN 206

Course Unit: 2 Units

Course Title: Applied Statistics II

Time: 2 Hours

Instruction: Answer Any Three Questions

- (1) (a) Consider a cattle feed lot. It is about to ship 800 head of cattle by train. A 90 percent confidence interval for the entire shipment's mean weight per animal is to be constructed with the help of a simple random sample, without replacement, of 30 animals. The sample mean weight per animal turns out to be 1301 pounds, with a sample standard deviation of 290 pounds. **(7 Marks)**
- (b) Consider a bus company. Each month, thousands of its buses arrive at a certain depot. A 99.9 percent confidence interval for the proportion of all buses arriving on schedule is to be constructed with the help of a simple random sample, without replacement, of 49 buses. The sample proportion of correct arrivals is 0.64. **(7 Marks)**
- (c) Consider a hotel manager who wants to know the mean time guests have to wait for room service. The population of waiting times is known to be not normally distributed, with a standard deviation of 11 minutes. A 95 confidence interval of the mean waiting time for 1000 orders is to be constructed with the help of a simple random sample, without replacement, of 20 orders. The sample mean turns out to be 32 minutes. **(6 Marks)**
- (2) (a) Outline the four required steps in hypothesis testing **(4 marks)**
- (b) Define the following concepts:
- i. Type 1 error
 - ii. Type 2 error **(4 Marks)**
- (c) An aircraft manufacturer needs Aluminum sheets that are, on average, 0.1 inches thick-no more, no less. The firm's quality inspector is to test the quality of supplies accordingly by measuring the thickness in a sample random sample of incoming sheets. Sample mean (\bar{X}) is 0.009 and sample size (n) is 100.
The level of significance is 5% with critical value of ± 1.96 **(6 Marks)**
- (d) For purposes of mounting engines on aircraft, a manufacturer needs specialty steel rods with an average tensile strength of at least 5000 pounds. The firm's quality inspector is to test incoming supplies accordingly by figuring the tensile strength evidenced in a simple random

sample of these rods. (This test is performed by noting the force at which the rods become distorted.) Sample mean (\bar{X}) is 4700 and sample size (n) is 64. (6 Marks)

The level of significance is 1% and critical Z value from the table-2.33

- (3) (a) An advertising agent wants to know whether the sex of consumers is independent of their preferences for 4 brands of coffee. The answer will determine whether different ads must be created for men's and women's magazine. (10 Marks)

Sex	Brand Preference				Total
	A	B	C	D	
(1) Male	18	25	15	2	60
(2) Female	32	5	5	2	40
Total	50	30	20	4	100

- (b) Consider the process of assembling television sets. Management may be interested in testing the hypothesis that the proportion of defective units produced (which has been 0.05 in the past) would be the same for each of 6 possible assembly-line speeds. The company statistician may be asked to perform a test at the 1 percent significance level, taking 6 samples of 100 TV sets each, while different assembly-line speeds are being maintained. The statistical procedure may well be the following four steps. (10 Marks)

Product Quality	Assembly-Line Speed (units per hour)						Total
	A=60	B=70	C=80	D=90	E=100	F=110	
(1) Defective	6 5	4 5	5 5	5 5	6 5	4 5	30
(2) Acceptable	94 95	96 95	95 95	95 95	94 95	94 95	570
Total	100	100	100	100	100	100	600

4. Consider the data in the table below

Individual	Education (years), X	Income (dollars per year), Y
A	2	5012
B	4	9680
C	8	28432
D	8	8774
E	8	21008
F	10	26565
G	12	25428
H	12	23113
I	12	22500
J	12	19456
K	12	21690
L	13	24750
M	14	30100
N	14	24798
O	15	28532
P	15	26000
Q	16	38908
R	16	22050
S	17	33060
T	21	48276

- (a) Find the estimated regression line (10 Marks)
 (b) Calculate the sample standard error of one estimate. (3 Marks)
 (c) Test the statistical significance of coefficient of education in the estimated regression equation. (3 Marks)
 (d) Calculate the sample coefficient of determination (r^2) for education and income (4 Marks)

(5) (a) A publisher wishes to estimate the number of words in a 935-manuscript. A random sample of 30 pages is taken; the results are shown in the first column of the table below

Number of Words on Sample Page X	X^2	Number of Words on Sample Page	X^2
240	57600	250	62500
226	51076	296	87616
292	85264	203	41209
227	51529	269	72361
244	59536	204	41616

Calculate the length of the manuscript and standard deviation. (8 Marks)

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(b) Suppose a franchiser of fast-food outlets wishes to gather information about the annual profits of current franchise holders. Past experience suggests that profits are normally distributed; a random sample of $n=12$ outlets yields these profit data for the previous year:

N61242	N10404	N91053	N48912
N28785	N76326	N67422	N40056
N92203	N96803	N97357	N92233

- (a) What is the point estimate of the mean annual profit of all the franchised outlets? **(2 Marks)**
- (b) What is the point estimate of the standard deviation of the annual profits of all the franchised outlets? **(4 Marks)**
- (c) Among all the franchisees, what is the proportion of profits in excess of N50000? Below N20000? **(4 Marks)**
- (d) Why would a franchiser want to get the type of information listed in (a) to (c)? **(2 Marks)**