CPE/2018/1014

A+

FEDERAL UNIVERSITY OYE-EKITI
FACULTY OF ENGINEERING
AGRICULTURAL AND BIORESOURCES ENGINEERING DEPARTMENT
2020/21 SECOND SEMESTER EXAMINATION

COURSE CODE: ABE302 **LEVEL:** 300
COURSE TITLE: ENGINEERING STATISTICS **(3 Units)**
INSTRUCTION: Attempt any **FIVE (5)** questions.
TIME ALLOWED: Three Hours

QUESTION ONE

OMORIC manufacturer Company deals with sweet products. It is assumed a large number of sweet are made of two types A and B. Type A contains 70% sugary and 30% sour ones, while type B contains reversed percentages. Furthermore, suppose that 60% of all sweet jars of type A and a jar of unknown type are presented for selection. If a sugary one was selected, which one of the two types (A and B) was offered? (20 marks)

QUESTION TWO

a) The performance of the students in a class in Mathematics and Statistics is given bellow:

Maths	60	62	64	66	68	70	72
Statistics	61	62	62	62	63	65	66

Obtain the Pearson's Product Moment Correlation Coefficient and comment on your result. (10marks)

b) The discharge of Dam is depending on the velocity (V) and cross-sectional area of the spillway. Given the following data:

Q (m^3/s	4	8	2	10	6
V (m/s)	8	7	1	5	9
A (m^2)	5	4	6	3	5

QUESTION THREE

a) Use the following observed data

	Yellow	Green	Brown
Round	315	108	213
Wrinkled	101	62	84
Oval	96	46	28

Calculate the expected values and perform a Chi-squared test to determine whether there is significant variation between the colours at P = 0.005 level of significant. Comment on your findings (10 marks)

X^2 Distributions

df	1	2	3	4	5	6
0.05	3.841	5.991	7.815	9.488	11.07	12.59

b) Consider ten (10) tosses of fair coin ("fair here means that the coin is not loaded so that at any single toss there is an equal chance of getting either a head or a tail). What is the probability of getting?
(i) At least three (3) heads (5marks)
(ii) Less than three (3) heads (5 marks)

QUESTION FOUR

a) A bowl contains 5 red balls, 4 white and 3 green balls, 2 balls are drawn one after the other without replacement. What is the probability?
(i) Of drawing a red ball first (2 marks)

(ii) That a white ball is drawn the second time given that a red ball was drawn the first time (4marks)

(iii) Of drawing a green ball and white ball in that order (4 marks)

(iv)

b) The average number of days school is closed due to students' unrest in a Federal University Oye-Ekiti is four (4) in a session. What is the probability that the school in this University would close for:

(a) 6 days per session (5 marks)

(b) Not more than two days per session? (5 marks)

QUESTION FIVE

The manufacturer produced two new types of nails under identical conditions was compared. The nils strength N/m^2 recorded as follows:

Example 1: 41, 44, 47, 44, 45, 46, 42, 48, 42, 44, 47, 43, 46, 42, 44

Example 2: 32, 34, 36, 34, 33, 37, 34, 34, 38, 36, 35, 34, 37, 34, 36

Determine whether the two samples are the same. Assume the significance level (a) 0.05, (b) 0.1 and (c) 0.01 (20 marks)

T table shown below used for QUESTION 5

df	5	6	10	14	20	22	24	26	28	30
0.01	4.032	3.707	3.169	2.977	2.845	2.819	2.797	2.779	2.763	2.750
0.05	2.571	2.447	2.228	2.145	2.086	2.074	2.064	2.056	2.048	2.042
0.1	2.015	1.943	1.812	1.761	1.725	1.717	1.711	1.706	1.701	1.697

QUESTION SIX

a) The average male drinks 2 litres of water when active outdoors (with standard deviation of 7 litres). You are planning a meeting for 50 FUOYE male students' representatives and will bring 110 litres of water. What is the probability that you will run out of water? (10marks)

b) In a recent poll of 200 households, it was found that 152 households had at least one computer. Estimate the proportion of households in the population that have at least one computer (10 marks)

QUESTION SEVEN

A test of the breaking strength of 6 ropes manufactured by a company showed a mean breaking strength of 15701.5N and a standard deviation of 319.38N whereas the manufacturer claimed a mean breaking strength of 16208N. Can we support the manufacturer's claim to a level of significance of (a) 0.05, (b) 0.1 and (c) 0.01 (20 marks)

FEDERAL UNIVERSITY OYE-EKITI
FACULTY OF ENGINEERING
RICULTURAL AND BIORESOURCES ENGINEERING DEPARTMENT
2017/18 SECOND SEMESTER EXAMINATION

OURSE CODE: ABE302 **LEVEL:** 300
COURSE TITLE: ENGINEERING STATISTICS **(3 Units)**
INSTRUCTION: Answer FIVE(5) full questions in all and at least two (2) questions from each Sections A and B
TIME ALLOWED: Three Hours

QUESTION ONE

(a) Define the following terms: (i) Statistics (ii) Stratified sampling (iii Statistic. (6 marks)
(b) State Four (4) Usefulness of Statistics in Engineering (4 marks)
(c) A bag contains three red, four white and five black balls. If three balls are taken, what is the probability that they are the same colour? (10 marks)

SECTION A

QUESTION TWO

(a) Use the following observed data

	Yellow	Green	Total
Round	315	108	432
Wrinkled	101	32	133
Totals	416	140	556

Calculate the expected values and perform a Chi-squared test to determine whether there is significant variation between the colours at P = 0.005 level of significant. Comment on your findings (10 marks)

X^2 Distributions

Df	1	2	3	4	5	6
0.05	3.841	5.991	7.815	9.488	11.07	12.59

(b) OMORIC manufacturer Company deals with sweet products. It is assumed a large numbers of sweet are made of two types A and B. Type A contains 70% sugary and 30% sour ones, while type B contains reversed percentages. Furthermore, suppose that 60% of all sweet jars of type A and a jar of unknown type are presented for selection. If a sugary one was selected, which one of the two types (A and B) was offered? (10 marks)

QUESTION THREE

(a) Consider ten (10) tosses of fair coin ("fair here means that the coin is not loaded so that at any single toss there is an equal chance of getting either a head or a tail). What is the probability of getting?

i. Only three (3) heads (2 marks)
ii. Less than three (3) heads (5 marks)
iii. More than two (2) heads (5 marks)

(b) The average number of days school is closed due to students unrest in a Federal University Oye-Ekiti is four (4) in a session. What is the probability that the school in this University would close for:

i. 6 days per session (3 marks)
ii. Not more than two days per session? (5 marks)

QUESTION FOUR

Use the following data

X	4	8	2	10	6
Y	8	7	11	5	9

(a) Obtain the two regression lines

(b) Obtain the estimate of Y when $x = 12$

obtain the estimate of x when $Y = 6$ (2 marks)

If 5 cars are sold in the market from a company produced 52 cars and 13 cars are brought to market, what is the probability that 3 of them sold will be white car

QUESTION FIVE

What is meant by the term sampling distribution

Assume that the heights of 3000 male students at a university are normally distributed, with mean 172.72 cm and standard deviation 7.62 cm. If 80 samples consisting of 25 students each are obtained. what would be the expected mean and standard deviation of the resulting sampling distribution of means if sampling were done (i) with replacement, (ii) without replacement? (18 marks)

QUESTION SIX

What do you understand by interval estimate? (2 marks)

A sample poll of 100 voters chosen at random from all voters in a given district indicated that 55% of them were in favour of a particular candidate

Find (a) 95% (b) 99% and (c) 97.73% confidence limits for the proportion of all the voters in favor of this candidate (18 marks)

QUESTION SEVEN

Define the following (i) Hypothesis testing (ii) Alternate Hypothesis (iii) Type I error (6 marks)

A test of the breaking strengths of 6 ropes manufactured by a company showed a mean breaking strength of 15700 kg and a standard deviation of 320 kg, whereas the manufacturer claimed a mean breaking strength of 16210 kg. Can we support the manufacturer's claim at a level of significance of (a) 0.05, (b) 0.01?

(14 marks)

FEDERAL UNIVERSITY OYE-EKITI
FACULTY OF ENGINEERING
AGRICULTURAL AND BIORESOURCES ENGINEERING DEPARTMENT
2016/17 SECOND SEMESTER EXAMINATION

COURSE CODE: ABE302
COURSE TITLE: ENGINEERING STATISTICS
INSTRUCTION: Answer any FIVE (5) questions in.
TIME ALLOWED: Three Hours

LEVEL: 300
(3 Units)

QUESTION 1

(a) State Five (5) Usefulness of Statistics in Engineering **5 Marks**

(b) Given the following table.

Class boundaries	10.5 – 20.5	20.5 – 30.5	30.5 – 40.5	40.5 – 50.5	50.5 – 60.5
Frequency	3	8	13	14	12

Compute (i) *Mean* (ii) *Standard deviation* (iii) *Mode* (iv)*Lower quartile* (v) 50th *Percentile* (vi) *Inter-quartile range* **15 Marks**

QUESTION 2

(a) State two differences between Correlation and Regression Analysis. **4 Marks**

(b) Measurements of the relative humidity in a store and the moisture content of a sample of raw materials (both in percentages) in twelve days yielded the following results:

Relative Humidity, X (%)	42	35	50	43	48	62	31	36	44	39	55	48
Moisture Content, Y (%)	12	8	14	9	11	16	7	9	12	10	13	11

i. Obtain the equations of the least squares line for the linear relationship between relative humidity (X) and moisture content (Y).

ii. Compute the value of moisture content given that relative humidity is 45%. (iii) Determine the correlation coefficient, *r* from the regression coefficients. **16 Marks**

QUESTION 3

(a) In 60 tosses of a die, the following distributions of numbers on the uppermost die face were obtained.

Number on face of die	1	2	3	4	5	6
Observed frequency	12	8	11	12	15	2

Using χ^2 test, determine whether the die is fair. **6 marks**

(b) Among the 300 employees of a company, 240 are union members, while the others are not. If 8 of the employees are chosen by lot to serve on the committee which administers the pension fund. Find the probability that 5 of them will be union members while the others are not? **6 Marks**

(c) The number of hits on a certain university website follows a Poisson distribution with a mean rate of four (4) per minute. What is the probability that fewer than three (3) messages are received in a period of 30 seconds? **6 marks**

QUESTION 4

(a) State Central Limit Theorem **3 Marks**

(b) The lifetime of a battery in a certain application is normally distributed with mean $\mu = 1400$ hours and standard deviation $\sigma = 200$ hours. (i) What is the probability that a battery will last more than 1800 hours? (ii) What is the probability that the lifetime of a battery is between 1350 and 1550 hours? **6 marks**

(c) Of all the registered automobiles in a certain state in Nigeria, 10 % violate the state emissions standard. Twelve automobiles are selected at random to undergo an emission test. Find the probability that fewer than three of them violate the standard. **5 marks**

(d) Moisture Content in percent by volume (x) and conductivity in mS/m (y) were measured for 50 soil specimens. The means and standard deviations were $\bar{x} = 8.1$, $\delta_x = 1.2$, $\bar{y} = 30.4$, $\delta_y = 1.9$. The correlation between conductivity and moisture were computed to be $r = 0.85$. Find the equation of the least squares line for predicting soil conductivity from moisture content. (ii) Compute the value of soil conductivity given that moisture content in percent by volume is 10. **6 Marks**

QUESTION 5

(a) *(i)* Differentiate between population and samples **4 Marks**

(ii) Describe 3 types of sampling methods that you know. **6 Marks**

(b) Assume that the heights of 3000 male students at a university are normally distributed; with mean 172.72 cm and standard deviation 7.62 cm. If 80 samples consisting of 25 students each are obtained, what would be the expected mean and standard deviation of the resulting sampling distribution of means if sampling were done (a) with replacement, (b) without replacement? **10 Marks**

QUESTION 6

(a) (i) What do you understand by a point estimate? Mention 3 examples **5 Marks**

(ii) Suppose that the following observations represent the number of Internet hours per week by 20 FUOYE students:

4.00	5.00	5.00	5.25	5.50	6.25	6.25	6.50	6.50	7.00
7.25	7.75	8.00	8.00	8.00	8.25	8.50	8.50	9.50	10.50

Determine a named point estimate for the data. **5 Marks**

What, in your own understanding is the limitation of this estimate? **2 Marks**

(b) The standard deviation of the lifetimes of a sample of 200 electric light bulbs was computed to be 100 hours. Find (a) 95% and (b) 99% confidence limits for the standard deviation of all such electric light bulbs. **8 Marks**

QUESTION 7

(a) (i) What are Biased and Unbiased estimates? **4 Marks**

(ii) Measurements of the diameters of a random sample of 200 ball bearings made by a certain machine during one week showed a mean of 2.09 cm and a standard deviation of 0.107 cm. Find (a) 90% and (b) 99.73% confidence limits for the mean diameter of all the ball bearings. **8 Marks**

(b) In 40 tosses of a coin, 24 heads were obtained. Find (a) 95% and (b) 99% confidence limits for the proportion of heads which would be obtained in an unlimited number of tosses of the coin. **8 Marks**

FEDERAL UNIVERSITY OYE-EKITI
FACULTY OF ENGINEERING
AGRICULTURAL AND BIORESOURCES ENGINEERING DEPARTMENT
2015/16 SECOND SEMESTER EXAMINATION

COURSE CODE: ABE 302
COURSE TITLE: ENGINEERING STATISTICS
LEVEL: 300
(3 Units)
INSTRUCTION: Answer any **FIVE (5)** questions. All questions carry equal marks.
TIME ALLOWED: Three Hours

QUESTION ONE (1)

(a) Define the following terms: (i) Statistics (ii) Weighted sampling (iii) Stratified sampling (iv) Statistic. *(6 marks)*

(b) The lifetime of a battery in a certain application is normally distributed with mean $\mu = 1400$ hours and standard deviation $\sigma = 200$ hours. (i) What is the probability that a battery will last more than 1800 hours? (ii) What is the probability that the lifetime of a battery is between 1350 and 1550 hours? *(6 marks)*

(c) In 60 tosses of a die, the following distributions of numbers on the uppermost die face were obtained.

Number on face of die	1	2	3	4	5	6
Observed frequency	12	8	11	12	15	2

Using χ^2 test, determine whether the die is fair. *(8 marks)*

QUESTION TWO (2)

(a) The following data show the relationship between humidity and moisture. Obtain the equations of the least squares line for the linear relationship between humidity (X) and moisture (Y). Compute the value of moisture given that humidity is 55%. *(10 marks)*

X	46	53	37	42	34	29	60	44	41	48	33	40
Y	12	14	11	13	10	8	17	12	10	15	9	13

(b) Moisture Content in percent by volume (x) and conductivity in mS/m (y) were measured for 50 soil specimens. The means and standard deviations were $\bar{\bar{x}} = 8.1$, $\delta_x = 1.2$, $\bar{\bar{y}} = 30.4$, $\delta_y = 1.9$. The correlation between conductivity and moisture were computed to be r = 0.85. Find the equation of the least squares line for predicting soil conductivity from moisture content. (ii) Compute the value of soil conductivity given that moisture content in percent by volume is 10. *(7 marks)*

(c) The number of hits on a certain university website follows a Poisson distribution with a mean rate of four (4) per minute. What is the probability that fewer than three (3) messages are received in a period of 30 seconds? *(3 marks)*

QUESTION THREE (3)

(a) The regression equations were calculated from a given set of observations for two random variables are:

$$x = -0.4y + 6.4$$

$$y = -0.6x + 4.6.$$

Calculate the means $\bar{x}$, $\bar{y}$ and the correlation coefficient, r. *(10 marks)*

(b) The life of a drill bit has a mean of 16 hours and standard deviation of 2.6 hours. Assuming a normal distribution, determine the probability of a sample bit lasting for (i) more than 20 hours (ii) less than 14 hours. *(5 marks)*

(c) Of all the registered automobiles in a certain state in Nigeria, 10 % violate the state emissions standard. Twelve automobiles are selected at random to undergo an emission test. Find the probability that fewer than three of them violate the standard. *(5 marks)*

QUESTION FOUR (4)

Suppose that Table 1 is a frequency distribution of the random sample of the weights of 100 male students of all 1546 students at Madonna University.

Class Weight (kg)	Frequency
60 – 62	5
63 - 65	18
66 – 68	42
69 – 71	27
72 – 74	8
	N = 100

(a) Compute (i) *Mean* (ii) Variance (iii) *Standard deviation* (iv)*Mode* (v) *Lower quartile* (vi) 50th *Percentile* (vii) *Inter-quartile range.* *(10.5 marks)*

(b) From the result obtained in (a), find the (i) 95% and (ii) 99% confidence intervals for estimating the mean weight of the University students. *(9.5 marks)*

QUESTION FIVE (5)

(a) What do you understand by the following terms as applied to Engineering Statistics: (i) Point estimate, (ii) interval estimate (iii) hypothesis, (iv) Null hypothesis (v) Power of a test. **(7.5 marks)**

(b) A survey of 1013 out of the U.S. population was conducted to estimate the proportion of the populace who believe in the continuation of an affirmative action program. Out of these people, 537 believed that affirmative action program should be continued.

(i) What is the point estimate of the population proportion of successes? *(5 marks)*

(ii) Estimate the population proportion of successes at a confidence interval of 90% *(7.5 marks)*

QUESTION SIX (6)

In the past a machine has produced washers having a mean thickness of 1.27 cm. To determine whether the machine is in proper working order, a sample of 10 washers is chosen for which the mean thickness is 1.35 cm and the standard deviation is 0.0762 cm inches. Test the hypothesis that the machine is in proper working order using a level of significance of (a) 0.05, (b) 0.01. *(20 marks)*

QUESTION SEVEN (7)

A sample poll of 100 voters chosen at random from all voters in a given district indicated that 55% of them were in favour of a particular candidate. Find (a) 95%, (b) 99% and (c) 99.73% confidence limits for the proportion of all the voters in favour of this candidate. *(20marks)*

FEDERAL UNIVERSITY OYE-EKITI
FACULTY OF ENGINEERING
AGRICULTURAL AND BIORESOURCES ENGINEERING DEPARTMENT
2014/15 SECOND SEMESTER EXAMINATION

COURSE CODE: ABE 302
COURSE TITLE: ENGINEERING STATISTICS **LEVEL:** 300
INSTRUCTION: Attempt all questions in section A and any two questions in section B. All questions carry equal marks **(3 Units)**
TIME ALLOWED: Three Hours

SECTION A

QUESTION ONE

(a). Define the following terms: (i) Simple random sampling (ii) Weighted sampling (iii) Stratified sampling (iv) A sample of convenience (v) Validity (vi) Central limit Theorem. **(6 marks)**

(b) The life of a drill bit has a mean of 16 hours and standard deviation of 2.6 hours. Assuming a normal distribution, determine the probability of a sample bit lasting for (i) more than 20 hours (ii) less than 14 hours. **(5 marks)**

(c) A batch of 200 plastic pipes consists of 150 pipes of desired length, 35 oversized pipes, and 25 undersized pipes. If five pipes are drawn at random without replacement, what is the probability of obtaining (i) none of the desired length (ii) two undersized (iii) one of the desired length. **(9 marks)**

QUESTION TWO

Measurements of the diameters of a random sample of 200 ball bearings made by a certain machine during one week showed a mean of 2.093 cm and a standard deviation of 0.107 cm. Find:

(a) 95 % confidence limits for the mean diameter of all the ball bearings. **(8 marks)**

(b) 99 % confidence limits for the mean diameter of all the ball bearings. **(6 marks)**

(c) 90% confidence limits for the limits for the mean diameter of the ball bearings. **(6 marks)**

QUESTION THREE

(a) Give the steps for testing the goodness of fit of a distribution. **(8 marks)**

(b) The following table gives the number of aircraft accidents that occurs during various days of the week. Find whether the accidents are uniformly distributed over the week.

Days	Sun	Mon	Tue	Wed	Thur	Fri	Sat
No of accidents	15	17	9	13	12	10	15

Given: The values of Chi-square significant at 5, 6, 7, degree of freedom are respectively 11.07, 12.59, 14.07 at the 5% level of significance. **(12 marks)**

SECTION TWO

QUESTION FOUR

(a) The number of hits on a certain university website follows a Poisson distribution with a mean rate of four (4) per minute. What is the probability that fewer than three (3) messages are received in a period of 30 seconds? **(5 marks)**

(b) A milling machine produces products with an average of 4 % rejects. If a random sample of 5 components is taken, determine the probability that it contains (i) no reject, (ii) less than two (2) rejects. **(10 marks)**

(c) Of all the registered automobiles in a certain state in Nigeria, 10 % violate the state emissions standard. Twelve automobiles are selected at random to undergo an emission test. Find the probability that fewer than three of them violate the standard. **(5 marks)**

QUESTION FIVE

(a) A test of the breaking strength of 6 ropes manufactured by a company showed a mean breaking strength of 15700 N/mm^2 and a standard deviation of 320N/mm^2, whereas the manufacturer claimed a mean breaking strength of 16210 N/mm^2. Can we support the manufacturer's claim at a level of significance of: **(12 marks)**

(i) 0.05 **(8 marks)**

(ii) 0.01

QUESTION SIX

Suppose that the heights 100 male students at FUOYE represent a random sample of the heights of all 2500 students at the University, the sample mean being 171.32 cm and the standard deviation 7.44 cm. Find:

(a) 95% confidence intervals for estimating the mean height of FUOYE university students. **(10 marks)**

(b) 99% confidence intervals for estimating the mean height of FUOYE university students. **(10 marks)**

QUESTION SEVEN

(a) The following regression equations were obtained from a correlation table:

$Y = 0.516X + 33.73$, $X = 0.512Y + 32.52$

Find the value of (i) the correlation coefficient,

(ii) the mean of X's and

(iii) the mean of Y's. **(10 marks)**

(b) The regression equations calculated from a given set of observations for two random variables are $x = -0.4y + 6.4$ and $y = 0.6x + 4.6$

Calculate (i) $\overline{x}$,

(ii) $\overline{y}$, and

(iii) r **(10 marks)**

AB E 302 TEST

2017/18 Session

Attempt all questions

QUESTION ONE

It is assumed a large numbers of sweet are made of two types A and B. Type A contains 70% sugary and 30% sour ones, while type B contains reversed percentages. Furthermore, suppose that 60% of all sweet jars of type A and a jar of unknown type are presented for selection. If a sugary one was selected, which one of the two types (A and B) was offered? (20 marks)

QUESTION TWO

a. What do you understand by Statistical inference? (2 marks)
b. Differentiate between point estimate and interval estimate. (4 marks)
c. State the general equation for a confidence interval for a population proportion. (2 marks)
d. Under what conditions can you use a t distribution. (2 marks)
e. Derive the formula for t distribution from the principle of te z score of sampling distribution. (10 marks)