



# DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY

## University Examinations 2020/2021

THIRD YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN **Mechanical Engineering, Electrical Engineering, BED Electrical**, FOURTH YEAR FIRST SEMESTER BACHELOR OF SCIENCE IN **Mechatronics & SECOND YEAR SECOND SEMESTER BACHELOR OF SCIENCE IN Civil Engineering & BTECH Civil.**

### SAS 2130: STATISTICS

DATE: <sup>th</sup> October 2020

TIME: 00:00 .m. - 00:00 .m.

**Instructions:** Answer QUESTION ONE and any other TWO QUESTIONS.

#### QUESTION ONE (30 Marks) (COMPULSORY)

- a). The times taken for 20 students to complete a puzzle were recorded to the nearest minute as follows:

23, 27, 24, 18, 20, 25, 58, 23, 27, 19, 20, 25, 23, 22, 26, 26, 23, 19, 21, 26

- i). Compute the quartiles and check if there is an outlier. [5 Marks]  
ii). By how much is the mean decreased if the outlier (*if present*) is not included? [2 Marks]  
iii). Draw a box-plot (excluding the outlier) and comment on the skewness of the data. [2 Marks]
- b). The table below shows the distribution of weights of 100 DeKUT students sampled from School of Engineering.

weight (kg)	60 - 62	62 - 66	66 - 69	69 - 72	72 - 74
Frequency	5	18	27	42	8

- i). Estimate the mean absolute deviation and the standard deviation. [4 Marks]  
ii). On the same graph, draw a histogram and a frequency polygon for these data. [4 Marks]

- c). The mean age of the combined group of men and women is 30.5 years. If the mean age of the sub-group of men is 35 years and that of the sub-group of women is 25 years, find out the percentage of men and women in the group. [4 Marks]
- d). A computer assembling company receives 24% of parts from supplier X, 36% of the parts from supplier Y, and the remaining 40% of parts from supplier Z. Five percent of parts supplied by X, ten percent of parts supplied by Y, and six percent of parts supplied by Z are defective. If an assembled computer has a defective part in it, what is the probability that this part was received from supplier Z? [4 Marks]
- e). A discrete random variable  $X$  can take the values 3, 5, 6, 8 and 10 only. given that  $P(X = 3) = 0.1$ ,  $P(X = 5) = 0.05$ ,  $P(X = 6) = 0.45$ ,  $P(X = 8) = 3P(X = 10)$ . Calculate;
- i).  $P(X = 10)$ . [2 Marks]
- ii).  $E(X)$ . [3 Marks]

**QUESTION TWO (20 Marks) (Optional)**

- a). The table below shows the marks obtained by 160 students in a statistics exam.

Marks	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90
No. of Students	20	36	$x$	$y$	15	5

The mode of the incomplete distribution is 56. Determine:

- i). The values of  $x$  and  $y$ . [5 Marks]
- ii). The median score. [2 Marks]
- iii). What was the score of the middle 50 % of the students? [4 Marks]
- iv). Mean and Standard deviation of the distribution using the coding method **{A=55}**. [4 Marks]
- b). Three computer viruses arrived as an e-mail attachment. Virus A damages the system with probability 0.4. Independently of it, virus B damages the system with probability 0.5. Independently of A and B, virus C damages the system with probability 0.2. Use a tree diagram to obtain possible outcomes and hence determine the probability that the system gets damaged. [5 Marks]

**QUESTION THREE (20 Marks) (Optional)**

- a). A student plays a game in which a fair six-sided die is tossed once. If the score is 1, 2, or 4, he loses KES 10. She wins  $x$  if the score is 3 or 5 and wins  $2x$  if the score is 6.
- i). Find the probability distribution or returns for this game. [2 Marks]
- ii). Find the mean and the standard deviation of returns when  $x = 8$ . [4 Marks]
- b). Among 1,000 applicants for admission to MSC. Analytics course at DeKUT, 600 were statistics graduates and 400 were non-statistics graduates, 30 % of statistics graduate applicants and 5 % non-statistics graduate applicants obtained admission. If an applicant selected at random is found to have been given admission, what is the probability that he or she is a statistics graduate? [3 Marks]

- c). A survey was conducted to investigate whether people tend to marry partners of about the same age. This question was addressed to 12 married couples and their ages were given in the following table.

Couples No.	1	2	3	4	5	6	7	8	9	10	11	12
Husband's Age(x)	30	29	36	72	37	36	57	48	37	50	51	36
Wife Age(y)	20	34	67	35	37	27	50	46	36	42	46	35

- i). Find the Pearson's moment correlation coefficient and interpret it. **[5 Marks]**  
 ii). Calculate the coefficient of determination and explain its meaning. **[2 Marks]**
- d). The standard eight pupils sat a mock examination in May and the KCPE examination in November. The marks obtained by the pupils in both examinations were as follows;

Mock Marks	20	24	33	46	46	45	55	56	69	69	72	82
KCPE Marks	28	27	28	40	42	45	50	45	55	45	73	68

Construct the Spearman's rank correlation and comment on the association.

**[4 Marks]**

**QUESTION FOUR (20 Marks) (Optional)**

- a). Giving an example in each case, differentiate the following terms as used in statistics:-
- i). Ordinal and Nominal data. **[2 Marks]**  
 ii). Mutually exclusive events. **[2 Marks]**  
 iii). Sample and Population. **[2 Marks]**  
 iv.) A statistics and a parameter. **[2 Marks]**
- b). The weekly expenditure of a female student in a college is KES. 720 while that of a male counterpart is KES. 320. If the average spending of a student is KES. 550, find the ratio of male to female students in the college. **[4 Marks]**
- c). Three machines A, B and C produces 50%, 30% and 20% of items in a factory. The % defective items from each of the machines are 3%, 4% and 5% respectively. If an item is chosen at random and is found to be defective, what is the probability that it was produced by machine B? **[4 Marks]**
- d). The following are scores obtained by students in a Statistics exam. 43, 47, 51, 48, 52, 50, 46, 49, 45, 52, 46, 51, 44, 50, 49, 46, 51, 49, 45, 44, 50, 48, 49, 50. Construct a box plot of the data and use it to comment on the skewness of the distribution. **[4 Marks]**

**QUESTION FIVE (20 Marks) (Optional)**

- a). Distinguish between correlation analysis and regression analysis. **[2 Marks]**
- b). An assesment under Competence Based Curriculum (C.B.C) was conducted on ten children to determine how a child’s ability in number work varied with his ability in handicrafts. The marks were awarded as follows:

Child	1	2	3	4	5	6	7	8	9	10
Numeracy	5	9	6	2	0	4	8	7	10	1
Craft	5	6	7	3	4	1	8	10	9	2

Calculate the Spearman’s rank correlation coefficient. State what it indicates about the relationship between numeracy and craft. **[5 Marks]**

- c). In a batch of manufactured items, 5% of the items have a fault. A diagnostic test has 90% chance of detecting an item that is faulty, but also 1% chance of giving a false position when an item really has no fault. Compute the probability that an item which has been diagonised as being faulty, is, in fact, faulty. Justify your calculations. **[4 Marks]**
- d). Determine the first four moments about the point  $A = 25$  of the following distribution. Hence investigate the skewness and peakedness of the distribution.

Class	0 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60
Frequency	10	25	40	10	5	2

**[9 Marks]**