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KIRIRI WOMEN'S UNIVERSITY OF SCIENCE AND TECHNOLOGY UNIVERSITY EXAMINATION, 2024/2025 ACADEMIC YEAR FIRST YEAR, SECOND SEMESTER EXAMINATION FOR THE BACHELOR OF EDUCATION (ARTS) **KMA 2115 BUSINESS STATISTICS**

Time: 8:30AM - 10:30AM

Date: 7TH AUGUST 2024 **INSTRUCTIONS TO CANDIDATES**

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS **OUESTION ONE (30 MARKS)**

A company hires both KMA students and BBIT students for the same kind of task. After some period of a) employment, some of each category are promoted and some are not. The table below shows the proportion of company's the employees among the said classes

| | Academic Qualification | | | | |
|--------------------|------------------------|---------------|--|--|--|
| Promotional Status | KMA Students | BBIT Students | | | |
| Promoted | 0.15 | 0.45 | | | |
| Not Promoted | 0.25 | 0.15 | | | |

Determine whether academic qualification is independent of promotional status

(5 Marks)

(4 Marks)

(4 Marks)

Given the data below b)

| Classes | 21-25 | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 | 51-55 | 56-60 | 61-65 | 66-70 |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Frequency | 7 | 13 | 9 | 18 | 12 | 21 | 11 | 9 | 7 | 3 |

Find:

- i) Mean using a suitable assumed value
- ii) Modal value of the observations
- The table below shows the number of wins in a given game and the corresponding probabilities c)

| X | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------|------|------|-------|-----|-------|-------|-------|-----|---|-----|
| P(X) | 0.01 | 0.02 | 0.005 | 0.2 | 0.001 | 0.003 | 0.001 | 0.1 | k | 0.1 |

Given that the wins are mutually exhaustive and that k is a positive constant, find

- i. The value of the constant k
- ii. Probability of at most 6 wins

(2 Marks) (3 Marks)

- In a consignment of 20 articles, just 4 are defective. If a random sample of 5 articles is taken from this d) consignment, find the probability that it will contain
 - i. No defective article
 - ii. 3 or more defective articles
- A company produces jars of English Honey. The weight of the glass jars used are normally distributed e) with a mean122.3g and standard deviation of 2.6g. calculate the probability that a randomly chosen jar will weigh less than 129.2g but more than 124.5g (5 Marks)

OUESTION TWO (20 MARKS)

An internet provision company sells three different internet products. The company records the number a) of new weekly subscriptions as shown in the table below

| Product | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 |
|-------------|--------|--------|--------|--------|--------|--------|--------|
| Product I | 19 | 20 | 21 | 24 | 25 | 21 | 20 |
| Product II | 15 | 16 | 18 | 19 | 16 | 16 | 14 |
| Product III | 27 | 28 | 25 | 31 | 32 | 25 | 28 |

For each product, calculate:

- Mean i.
- ii. Standard deviation
- iii. Use coefficient of variation to determine which product has a stable number of subscriptions

(4 Marks)

(4 Marks)

(3 Marks)

(5 Marks)

- In a factory, machine A produces 30% of the output while machine B and machine C produces 25% and b) 45% of the output respectively. 1% of the output of machine A is defective while machine B and C has defective proportions of 1.2% and 2%. In a day's run, the three machines produce 10,000 items. An item is drawn at random from the day's output and is found to be defective. Find the probability that it was produced by
 - Machine A i. (4 Marks) ii. Machine B (2 Marks) (2 Marks)
 - iii. Machine C

QUESTION THREE (20 MARKS)

The age distribution of all players in the national teams in a certain country is shown below. a)

| Age (Years) | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 50-54 |
|----------------|-------|-------|-------|-------|-------|-------|-------|
| No. of Players | 11 | 24 | 30 | 18 | 11 | 5 | 1 |

- i. Determine the cut-off ages if 30%, 50% and 20% of the players must belong to Harambee, Malkia and Simba teams respectively (7 Marks)
- ii. Use coefficient of skewness to examine whether age distribution exhibits normal distribution. (4 Marks)
- b) Explain the four components of time series
- Fit a linear trend line equation for the following data and obtain the trend values using the fitted trend c) line. Use t = year-1983(5 Marks)

(3 Marks) (4 Marks)

| Year | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|------|------|------|------|------|------|------|
| No. of production units, X _t | 125 | 128 | 133 | 135 | 140 | 141 | 143 |

QUESTION FOUR (20 MARKS)

a) A random sample of 50 patients suffering from headache were treated with a new drug and their time to recovery (to the nearest minutes) were as shown below

| 586 | 740 | 754 | 456 | 784 | 467 | 751 | 468 | 734 | 731 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 690 | 730 | 654 | 570 | 654 | 620 | 597 | 601 | 583 | 707 |
| 590 | 477 | 579 | 650 | 473 | 577 | 781 | 544 | 605 | 704 |
| 700 | 604 | 490 | 508 | 700 | 607 | 607 | 631 | 580 | 701 |
| 602 | 647 | 760 | 588 | 730 | 645 | 588 | 504 | 664 | 579 |

Construct a group frequency distribution for these data using classes 451-480, 481-510, 511-540,..... etc and use the frequency table obtained to calculate interquartile range (8 Marks)

- b) A certain type of electric bulb has a burning life of H hours which is normally distributed with mean 1300 hours and standard deviation of 125 hours.
 - i. What is the probability that a bulb picked at random will burn more than 1500 hours? (3 Marks)
 - ii. If the manufacturer guarantees to replace any bulb which burn for less than 1050 hours, what percentage of the bulbs will have to be replaced (4 Marks)
- c) A random variable *X* has a distribution function

$$f(x) = \begin{cases} \frac{1}{2}x, & 0 \le x \le 2\\ 0, & elsewhere \end{cases}$$

- i. Show that f(x) is a pdf
- ii. Find $Pr(0.5 \le x \le 1)$

QUESTION FIVE (20 MARKS)

- a) A sample of 40 sales receipts from a grocery store has $\overline{x} = \$ 137$ and $\sigma = \$ 30.2$. Use these values to test whether the mean of the sales at the grocery store are less than \$150 at 5% significance level.
- b) A manufacturer of optical lenses has the following data on the cost per unit (in USD) of a certain custommade lenses and the number of units made in each order

| Number of Units (X) | 1 | 3 | 5 | 7 | 10 | 12 |
|---------------------|----|----|----|----|----|----|
| Cost per Unit (Y) | 58 | 52 | 46 | 40 | 37 | 22 |

i. Obtain the simple linear regression model



c) In a certain county, only 40% of all construction companies conform to regulations provided by the National Construction Authority. From a random sample of six companies, calculate the probability that

| i. | At least three have conformed | (3 Marks) |
|------|--|-----------|
| ii. | At most four have not conformed | (3 Marks) |
| iii. | Obtain standard deviation for the distribution of non-conforming companies | (2 Marks) |

(2 Marks) (3 Marks)

(5 Marks)

(5 Marks)

(2 Marks)