



ATD LEVEL II

DCM LEVEL II

**BUSINESS MATHEMATICS AND STATISTICS**

**TUESDAY: 28 November 2017.**

**Time Allowed: 3 hours.**

**Answer ALL questions. Marks allocated to each question are shown at the end of the question. Show ALL your workings.**

**QUESTION ONE**

(a) Define the following terms as used in index numbers:

- (i) Simple index number. (2 marks)
- (ii) Chain base method. (2 marks)
- (iii) Stock market index. (2 marks)
- (iv) Consumer price index. (2 marks)

(b) Samson Mbango has invested a certain amount of money in a bank. He shared the amount invested as follows:

- $\frac{7}{10}$  of the money to his eldest son.
- $\frac{1}{5}$  of the remainder to his youngest son.
- The balance to his wife.

The wife invested  $\frac{2}{3}$  of her share in another bank and remained with Sh.250,000 in cash.

**Required:**

The amount received from Samson Mbango by the:

- (i) Wife. (4 marks)
- (ii) Eldest son. (1 mark)
- (iii) Youngest son. (1 mark)

(c) A wholesaler sold 105 packets of sugar and 224 packets of salt at a total sale of Sh.61,320 on a certain day. On the same day, the wholesaler supplied 245 packets of sugar and 96 packets of salt to a local supermarket making a total sale of Sh.40,680.

**Required:**

Using matrix algebra, determine the selling price of a packet of sugar and a packet of salt.

(6 marks)

**(Total: 20 marks)**

**QUESTION TWO**

(a) The cash price of a washing machine is Sh.980,000. A buyer pays a deposit of Sh.255,000 and pays the balance in eighteen monthly instalments of Sh.51,000 each and a final payment of Sh.46,000.

**Required:**

The amount of money the buyer would save by paying the cash price for the washing machine.

(4 marks)

- (b) XYZ Ltd. manufactured 800 items at a total cost of Sh.985,600. The company has a policy of 20% profit margin on every item.

**Required:**

The unit selling price charged on the items by XYZ Ltd.

(4 marks)

- (c) A research study of 200 households in a certain county yielded the following information about travel plans of the households for the next new year celebrations:

- 70 households plan to travel to Mombasa.
- 76 households plan to travel to Nakuru.
- 68 households plan to travel to Kisumu.
- 26 households plan to travel to both Mombasa and Nakuru.
- 22 households plan to travel to both Mombasa and Kisumu.
- 32 households plan to travel to both Nakuru and Kisumu.
- 10 households plan to travel to Mombasa, Nakuru and Kisumu.

**Required:**

- (i) A venn diagram to represent the above information. (2 marks)
- (ii) Number of households who will travel to exactly one destination. (2 marks)
- (iii) Number of households who will travel to more than one destination. (2 marks)
- (iv) Number of households who will travel to at least one destination. (2 marks)
- (d) The probability that a woman aged 55 years will be alive in 2045 is  $\frac{6}{8}$  while the probability that her husband now aged 65 years will be alive in 2045 is  $\frac{5}{6}$ .

**Required:**

The probability that at least one of them will be alive in 2045.

(4 marks)

(Total: 20 marks)

**QUESTION THREE**

- (a) Define the following terms:

- (i) Geometric mean. (2 marks)
- (ii) Skewness. (2 marks)
- (iii) Kurtosis. (2 marks)

- (b) The following is the age distribution of 1,000 people working in an organisation:

Age (years)	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65
Frequency	30	160	210	180	145	105	70	60	40

During the ongoing labour negotiations, the organisation has agreed with the labour union to reduce the manpower requirements to 75% of the present number due to continuous losses and impending wage increment according to the following schemes:

1. Retrench the first 15% from the lower age group due to inexperience.
2. Retire 10% from the highest age groups.

**Required:**

- (i) The new age groups and their frequencies after the above schemes are implemented. (5 marks)
- (ii) The mean age of the retained workers. (2 marks)
- (iii) The standard deviation of the ages of the retained workers. (5 marks)
- (iv) The coefficient of variation. (2 marks)

(Total: 20 marks)

**QUESTION FOUR**

(a) Distinguish between the following terms:

- (i) Compensating errors and systematic errors. (4 marks)
- (ii) Discrete data and continuous data. (4 marks)

(b) The value of a car when new is Sh.3,800,000. In its first year, the car depreciates in value to Sh.2,660,000. In the second year, it depreciates to Sh.2,128,000. In the third year, the depreciation of the car is 8% of its value at the beginning of the second year.

**Required:**

The value of the car at the beginning of the fourth year. (4 marks)

(c) A farmer has harvested 580 bags of maize. The costs incurred by the farmer are estimated as follows:

Rent for the land	Sh.240,000
Cost of inputs	Sh.150,000 ± Sh.1,000
Labour	Sh.80,000 ± 4%
Transportation costs	Sh.45,000 ± 5%

The farmer intends to sell all the bags of maize at Sh.1,200 ± Sh.100 each.

**Required:**

- (i) The minimum profit the farmer can make. (4 marks)
  - (ii) The maximum profit the farmer can make. (4 marks)
- (Total: 20 marks)**

**QUESTION FIVE**

(a) Distinguish between “deciles” and “percentiles”.

(4 marks)

(b) The distribution of weekly wages of 600 workers in a certain farm is as follows:

Weekly wages (Sh.)	1,025-1,100	1,100-1,175	1,175-1,250	1,250-1,325	1,325-1,400	1,400-1,475
Number of workers	72	168	192	72	60	36

**Required:**

- (i) The median weekly wage. (2 marks)
  - (ii) A percentage cumulative frequency curve. (6 marks)
  - (iii) The limits of weekly wages that lie between first and third quartiles. (5 marks)
  - (iv) Estimate graphically the percentage of workers earning weekly wages of between Sh.1,175 and Sh.1,400. (3 marks)
- (Total: 20 marks)**
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