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ATD LEVEL II

DCM LEVEL II

BUSINESS MATHEMATICS AND STATISTICS

TUESDAY: 27 November 2018.

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) State four characteristics of a good questionnaire. (4 marks)
- (b) Explain three advantages of the interview method of data collection. (6 marks)
- (c) Hamisi Ali bought a baking machine at a cash price of Sh.100,000 on hire purchase terms. He paid an initial deposit of 20% of the cash price. An interest of 15% per annum is charged on the outstanding balance for the period of repayment. The balance plus the interest was to be paid in 24 equal monthly instalments. A customer who purchases the machine on cash basis is given a 15% discount on the cash price.

Required:

The amount of money Hamisi Ali would have saved if he had bought the baking machine on cash basis. (4 marks)

- (d) A manufacturer produces two commodities x and y. In September 2018, the manufacturer produced 5 units of commodity x and 6 units of commodity y at a cost of Sh.24,400. In October 2018, the manufacturer produced 7 units of commodity x and 9 units of commodity y at a cost of Sh.35,600.

Required:

- (i) Form simultaneous equations to represent the above information. (2 marks)
- (ii) Using matrix algebra, compute the cost of producing each unit of commodity x and commodity y. (4 marks)

(Total: 20 marks)

QUESTION TWO

- (a) Define the following terms as used in set theory:
- (i) Universal set. (2 marks)
- (ii) Null set. (2 marks)
- (iii) Subset. (2 marks)
- (b) Distinguish between the following terms:
- (i) Ratio and proportion. (2 marks)
- (ii) Discrete variables and continuous variables. (2 marks)
- (c) The probability that a student will pass a Mathematics examination is $\frac{2}{3}$ and the probability that he will fail an English examination is $\frac{5}{9}$. The probability that he will pass at least one examination is $\frac{4}{5}$.

Required:

The probability that the student will pass both Mathematics and English examinations. (4 marks)

- (d) The following data show the distribution of daily wages in a certain company:

| Wages (Sh.) | Number of workers |
|-------------|-------------------|
| 40-50 | 20 |
| 50-60 | 25 |
| 60-70 | 36 |
| 70-80 | 72 |
| 80-90 | 51 |
| 90-100 | 40 |

Required:

The harmonic mean of the above data. (6 marks)

(Total: 20 marks)

QUESTION THREE

- (a) John Otieno has recently been employed by Baraka Ltd. as an accountant. He has been offered a starting salary of Sh.720,000 per annum with an annual increment of 10 per cent on the previous year's salary.

Assume that John Otieno has a 35-year working life.

Required:

- (i) John Otieno's annual salary in the 35th year of his working life. (3 marks)
- (ii) The total amount that John Otieno will have earned during his 35-year working life. (3 marks)
- (b) A certain salesman is paid a monthly basic salary and a commission on the sales made. The salesman earns a commission at the rate of x per cent on the first Sh.300,000 of sales made and y per cent for any additional sales made above Sh.300,000.

During the months of January, February and March 2018, the salesman made sales and gross earnings as shown in the table below:

| Month | January 2018 | February 2018 | March 2018 |
|----------------------|-----------------|------------------|---------------|
| Sales (Sh.) | 800,000 | 1,200,000 | 200,000 |
| Gross earnings (Sh.) | 63,000 | 79,000 | 37,000 |

Required:

- (i) The rates of commission (x and y) applied to the sales made. (6 marks)
- (ii) Basic salary of the salesman. (2 marks)
- (iii) Gross earnings for the month of April 2018 if the salesman made sales of Sh.1,500,000. (2 marks)
- (c) A Kenyan businessman imported 15,000 gold chains from the USA at a cost of 75 US dollars per chain. The businessman incurred additional expenses as follows:

| | |
|--------------------------|------------|
| Freight charges | Ksh.40,000 |
| Insurance on consignment | Ksh.90,000 |
| Customs duty per chain | Ksh.150 |

Assume 1 US dollar = Ksh.95

Required:

- (i) The total cost of the gold chain consignment in Kenya Shillings. (2 marks)
- (ii) The price at which the businessman should sell each chain to make a profit of 15% on the total cost of the consignment. (2 marks)

(Total: 20 marks)

QUESTION FOUR

- (a) The following are the weights in Kilogrammes of 88 students in the Business Mathematics and Statistics class at Gombajeri College:

| Weights of students (Kilogrammes) | Number of students |
|--------------------------------------|-----------------------|
| 45-49 | 4 |
| 49-53 | 8 |
| 53-57 | 12 |
| 57-61 | 15 |
| 61-65 | 21 |
| 65-69 | 13 |
| 69-73 | 8 |
| 73-77 | 5 |
| 77-81 | 2 |

Required:

- (i) Coefficient of variation of the weights of the students. (8 marks)
- (ii) Median weight of the students. (2 marks)
- (iii) Modal weight of the students. (2 marks)
- (b) A firm that produces metal locks has an estimated demand function of $P = 7.5x - 150$ (in thousands of shillings) and a total cost function of $TC = 15x^2 - 1050x - 750$ (also in thousands of shillings) where x is the quantity of metal locks produced in units.

Required:

- (i) The break-even number of metal locks. (4 marks)
- (ii) The maximum profit of the firm. (4 marks)
- (Total: 20 marks)**

QUESTION FIVE

- (a) Differentiate between an "arithmetic progression" and a "geometric progression". (4 marks)
- (b) The data below show the monthly output of maize in thousands of Kilogrammes from a maize miller for the years 2016 and 2017:

| Month | 2016 | 2017 |
|-----------|------------------------------------|------------------------------------|
| | Output in thousands of Kilogrammes | Output in thousands of Kilogrammes |
| January | 23 | 25 |
| February | 21 | 29 |
| March | 16 | 27 |
| April | 15 | 30 |
| May | 12 | 26 |
| June | 10 | 18 |
| July | 9 | 15 |
| August | 9 | 10 |
| September | 12 | 8 |
| October | 16 | 12 |
| November | 14 | 16 |
| December | 18 | 20 |

Required:

- (i) Construct a Z-chart to represent the above data. (14 marks)
- (ii) Comment on the output trend of the maize miller as illustrated by the Z-chart in (b)(i) above. (2 marks)
- (Total: 20 marks)**
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