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ATD LEVEL II

DCM LEVEL II

BUSINESS MATHEMATICS AND STATISTICS

TUESDAY: 21 May 2019.   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)   Differentiate between the following terms with respect to statistical inquiry:

      (i)   "Census inquiry" and "sample inquiry".   (2 marks)

      (ii)   "Open inquiry" and "confidential inquiry".   (2 marks)

(b)   State four properties of a good measure of dispersion.   (4 marks)

(c)   The 10th term of a geometric series is 177,147 and the 6th term of the same series is 2,187:

      Required:
      (i)   The common ratio.   (2 marks)

      (ii)   The value of the first term.   (2 marks)

(d)   Bundacho Employment Bureau has shortlisted 7 male and 4 female applicants for interview.

      There are only 3 job positions available for employment.

      Required:
      (i)   Represent the above information in a tree diagram.   (6 marks)

      (ii)   The probability that the three employees selected are of the same gender.   (2 marks)
                                                                                    (Total: 20 marks)

QUESTION TWO
(a)   (i)   Distinguish between "primary data" and "secondary data".   (2 marks)

      (ii)   Explain three methods that could be used in the collection of primary data.   (6 marks)

(b)   The following table shows the quantities of four types of construction materials sold and their unit prices in the years 2017 and 2018:

Type of construction material	Year 2017		Year 2018	
	Price (Sh.)	Quantity (Units)	Price (Sh.)	Quantity (Units)
Tiles	500	100	800	120
Roofing sheets	800	140	1,000	120
Steel bars	400	150	800	110
Timber	500	100	900	100

Required:
Using the year 2017 as the base year, calculate:

(i)   Laspeyre's price index.   (4 marks)

(ii)   Paasche's price index.   (4 marks)

(iii)   Fisher's ideal price index.   (4 marks)
(Total: 20 marks)

QUESTION THREE

(a)   Giving an example in each case, differentiate between a "scalar matrix' and an "identity matrix".   (4 marks)

(b)   A certain company produced 20 units of product P and 40 units of product Q at a total cost of Sh.10,800 in the month of March 2019. The company also produced 30 units of product P and 25 units of product Q at a total cost of Sh.9,200 in the month of April 2019.

      Required:
      Using matrix algebra, calculate the cost of producing a unit of product P and a unit of product Q. (Use Cramer's method).
                                                                                             (6 marks)

(c)   A businessman acquired a second-hand pickup at a cost of Sh.1,100,000. The estimated useful life of the pickup was 5 years and its scrap value was Sh.300,000.

      Required:

(i)   The annual rate of depreciation using the reducing balance method.   (4 marks)

(ii)   The net book value of the pickup after the third year using reducing balance method.   (2 marks)

(iii)   The difference between the net book values of the pickup after the 4th year using reducing balance method and the straight line method.   (4 marks)
                                                                                              (Total: 20 marks)

QUESTION FOUR

(a)   The table below shows the salaries earned by 104 employees of Excel Ltd. in the month of April 2019:

Monthly salary Sh. "000"	Number of employees
10 and under 15	10
15 and under 20	34
20 and under 25	42
25 and under 30	6
30 and under 35	6
35 and under 40	4
40 and under 50	2

      Required:

(i)   The mean monthly salary.   (4 marks)

(ii)   The standard deviation of the monthly salary.   (4 marks)

(iii)   The coefficient of variation of the monthly salary.   (2 marks)

(b) A quadratic function is given as $y = 2x^2 - 5x - 12$.

The domain of x values is in the range of $-2 \leq x \leq 5$.

Required:

(i) A graphical representation of the above quadratic function within the given range of x values. (6 marks)

(ii) Using the graphical representation in (b) (i) above, solve the equation $2x^2 - 5x - 12 = 0$. (2 marks)

(iii) Using the graphical representation in (b) (i) above, solve the equation $2x^2 - 5x - 7 = 0$. (2 marks)

(Total: 20 marks)

QUESTION FIVE

(a) Using an illustration in each case, define the following terms as used in set theory:

(i) Union of a set. (2 marks)

(ii) Intersection of a set. (2 marks)

(b) Use the elimination method to solve the following simultaneous equations:

$$4x + 3y = 26$$
$$2x - y = 8$$

(4 marks)

(c) A machine costs Sh.850,000 on cash basis. On hire purchase terms, an initial deposit of 20% of the cash price is required. A simple interest of 10% is charged on the outstanding balance for 5 years. Customers who purchase the machine on cash basis are granted a 4% discount on the cash price.

Required:
The amount saved by a customer who purchases the machine on cash basis. (6 marks)

(d) A firm has analysed its prices and costs for a certain product and has developed the following functions:

$R = 400q - 4q^2$

$C = q^2 + 10q + 30$

Where,
R = Total revenue
C = Total cost
q = Units produced and sold

Required:

(i) The profit function. (2 marks)

(ii) The number of units produced and sold in order to maximise profits. (2 marks)

(iii) The maximum profit. (2 marks)

(Total: 20 marks)

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