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CAMS LEVEL I

FUNDAMENTALS OF BUSINESS MATHEMATICS

TUESDAY: 24 November 2020.

Time Allowed: 3 hours.

Answer any FIVE questions. ALL questions carry equal marks. Show ALL your workings.

QUESTION ONE

(a) Outline four properties of linear functions. (4 marks)

(b) The following quadratic function is provided:

$$y = 3x^2 - 7x + 2$$

Required:

(i) Plot the quadratic function curve within the limits $-2 \leq x \leq 4$. (6 marks)

(ii) Solve the equation $3x^2 - 7x + 2 = 0$ using the graph plotted in (b) (i) above. (1 mark)

(iii) Solve the equation $3x^2 - 7x - 2 = 0$ using the graph plotted in (b) (i) above. (1 mark)

(c) Simplify:

(i) $8^n \times 2^{2n} \div 4^{3n}$ (2 marks)

(ii) $16^{(\frac{3}{4})n} \div 8^{(\frac{5}{3})n} \times 4^{n+1}$ (3 marks)

(iii) $\log 4 + 2\log 3 - \log 6$ (3 marks)

(Total: 20 marks)

QUESTION TWO

(a) A father shared out his property to his family members as follows:

- Son received $\frac{1}{3}$ of the total.
- Daughter received $\frac{1}{3}$ of the total.
- Wife received $\frac{2}{3}$ of the remainder.
- Younger brother and sister shared the balance in the ratio of 3:4 respectively.

Required:

If the younger brother received Sh.227,500, calculate the share of each beneficiary. (6 marks)

(b) A tourist visiting East Africa had 30,000 Swiss Francs. While in Kenya, he converted the Swiss Francs into Kenya Shillings and made the following payments:

- Paid transaction fees at 2%.
- Bought a Kenyan necklace for 3 US dollars.
- Bought a Kenyan basket for 40 Sterling pounds.

Before leaving for Uganda, he converted the remaining currency into Uganda shillings.

The following rates were applicable during the visit:

- 1 Swiss franc = Ksh.108.78.
- 1 US dollar = Ksh.103.50.
- 1 Sterling pound = Ksh.126.
- 1 Kenya shilling = Ugsh.35.

Required:

The amount received in Uganda shillings. (5 marks)

- (c) A retailer bought second-hand shirts at a cost of Sh.6,120 per dozen. She later sold all the shirts at a 20% mark-up before allowing for a trade discount of 10% on the marked price of each shirt.

Required:

The marked price of each shirt. (4 marks)

- (d) A farmer estimates that he needs 12 tractors to plough a piece of land in 15 days if he starts the work immediately.

Required:

(i) The number of tractors required to complete the work on time assuming that there is a delay of 5 days in starting the work. (3 mark)

(ii) The number of days required to complete the work assuming that the original number of tractors is reduced by a third. (2 marks)

(Total: 20 marks)

QUESTION THREE

- (a) Outline two advantages of bar charts as a method of representing data. (2 marks)

- (b) Highlight four sources of secondary data. (4 marks)

- (c) The following table shows the length of 40 metal rods from a manufacturer recorded to the nearest millimetre (mm):

149	138	164	150	132	144	125	157
152	146	158	140	147	136	148	144
154	168	126	138	176	163	119	165
140	146	173	142	147	135	153	135
145	161	145	135	142	150	156	128

Required:

(i) A frequency distribution table using class intervals of 5mm. (6 marks)

(ii) A histogram and frequency polygon depicting the distribution of the length of the rods. (8 marks)

(Total: 20 marks)

QUESTION FOUR

- (a) Summarise two advantages and two disadvantages of the mode as a measure of central tendency. (4 marks)

- (b) The distribution of daily wages (in shillings) of 200 workers in a certain farm is as follows:

Monthly wages (Shillings)	150 – 220	220 – 290	290 – 360	360 – 430	430 – 500	500 – 570
Number of workers	24	50	64	30	20	12

Required:

(i) The mean daily wage. (2 marks)

(ii) The modal daily wage. (3 marks)

(iii) The median daily wage. (3 marks)

(iv) The standard deviation of the daily wages. (3 marks)

- (c) A motor vehicle that costs Sh.820,000 is depreciated using the reducing balance method to a scrap value of Sh.215,000 within a useful life of 6 years.

Required:

The annual rate of depreciation of the motor vehicle using the logarithm method.

(5 marks)

(Total: 20 marks)

QUESTION FIVE

- (a) In the year 2019, George Ratemo earned a salary of Sh.456,000 plus a house allowance of 15% of the salary and a medical allowance of Sh.5,500 per month. He was also entitled to a personal tax relief of Sh.14,400 per annum.

The following taxation rates were applicable for the year 2019:

Annual income Sh.	Tax rate %
On the first Sh.129,900	10
On the next Sh.125,000	15
On the next Sh.125,000	20
On the next Sh.125,000	25
On all income over Sh.504,900	30

Required:

- (i) Total taxable income for the year 2019. (2 marks)
- (ii) The total tax payable by George Ratemo for the year 2019. (6 marks)
- (iii) Net salary for the year 2019. (2 marks)

- (b) Find the following integrals:

(i) $\int (5x^2 - 8x + 5) dx$. (2 marks)

(ii) $\int (-6x^3 + 9x^2 + 4x - 3) dx$. (2 marks)

- (c) It costs a tailor Sh.26,000 to make 12 pairs of trousers and 8 shirts. The cost of making 5 pairs of trousers and 11 shirts is Sh.18,500. The tailor makes a profit of 30% and 20% on the cost of a pair of trousers and a shirt respectively.

Required:

- (i) The cost of making a pair of trousers and a shirt using matrix algebra. (4 marks)
- (ii) The selling price of a pair of trousers and a shirt. (2 marks)

(Total: 20 marks)

QUESTION SIX

- (a) Define the following terms as used in probability:

- (i) Event. (2 marks)
- (ii) Experiment. (2 marks)
- (iii) Outcome. (2 marks)

- (b) Macz Limited intends to employ some workers to address its staffing needs. The candidates were taken through all the three stages of an interview. Out of the 800 candidates who were interviewed, the following failed the interview at the stated stages. 80 at stage 1, 72 at stage 2 and 36 at stage 3.

Required:

- (i) Represent the above information in a tree diagram. (3 marks)
- (ii) The probability that a randomly selected candidate will pass all the three stages of interview. (2 marks)
- (iii) Approximate the number of candidates that should be interviewed in order for 120 candidates to successively pass all the three stages of the interview. (2 marks)

- (c) In an arithmetic progression, the thirteenth term is 27 and the seventh term is three times the second term.

Required:

- (i) The first term. (3 marks)
- (ii) The common difference. (1 mark)
- (iii) Sum of the first ten terms. (3 marks)

(Total: 20 Marks)

QUESTION SEVEN

- (a) Find the value of the following:

(i) $\left(\frac{27}{8}\right)^{-2/3}$ (2 marks)

(ii) $\frac{27^{1/2} \times 243^{1/2}}{243^{3/4}}$ (3 marks)

- (b) Johnstone Odera wishes to invest and accumulate Sh.5,000,000 at the end of five years. The compound interest rate being offered by Faidika Bank is 20% per annum.

Required:

The initial amount that should be invested in order to accumulate the projected amount. (3 marks)

- (c) Differentiate the following functions:

(i) $y = 3x^3 - 4x^2 + 3x + 10$. (2 marks)

(ii) $y = 0.5x^2 + x^{1/2} + 6$. (2 marks)

- (d) Solve the following simultaneous equations using the elimination method:

$$\begin{aligned} 3x + 2y &= 106 \\ 2x + 4y &= 92 \end{aligned}$$

(4 marks)

- (e) Solve the following equation:

$$3x^2 - 7x + 2 = 0$$

(4 marks)

(Total: 20 marks)

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