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ATD LEVEL II

DCM LEVEL II

BUSINESS MATHEMATICS AND STATISTICS

TUESDAY: 31 August 2021.

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) The weekly wage bill for three supervisors and thirty attendants in branch A of a supermarket is Sh.434,100. Branch B of the supermarket pays a weekly wage of Sh.266,400 for two supervisors and eighteen attendants.

Required:

(i) A matrix equation for the supermarket's weekly wage bill. (2 marks)

(ii) The weekly wage rate of a supervisor and an attendant using the matrix equation obtained in (a) (i) above. (4 marks)

- (b) Sophia Wakesho intends to invest Sh.200,000 in one of two banks, for a period of six years. Royal Bank offers 8% interest compounded annually and Bikap Bank offers 7.8% interest compounded semi-annually.

Required:

Advise Sophia Wakesho on which bank to invest in order to get maximum return. (4 marks)

- (c) The following information relate to product "we" manufactured by Pendo Limited:

$$\text{Revenue function, } R = 28Q - Q^2$$

$$\text{Marginal cost function, } C = 2Q - 8$$

$$\text{Fixed cost} = \text{Sh.64}$$

Where Q = Number of units produced

Required:

Determine the maximum profit. (5 marks)

- (d) A transporter uses two vehicles, A and B in his transport business. In a certain week he made 6 trips and 3 trips using vehicle A and B respectively at a total cost of Sh.35,910. Had the transporter made 2 trips and 8 trips using vehicle A and B respectively, the total cost would have been Sh.5,950 less.

Required;

Determine the cost of using each vehicle. (5 marks)

(Total: 20 marks)

QUESTION TWO

Yusufu Ali has provided you with the following information for his outlets A and B for the past ten months:

Month	Sales in outlet A	Sales in outlet B
	Sh."000"	Sh."000"
July 2020	3,550	4,000
August 2020	4,000	3,250
September 2020	3,850	3,000
October 2020	3,800	2,250

	Sh. "000"	Sh. "000"
November 2020	3,400	2,340
December 2020	3,750	2,750
January 2021	3,650	2,400
February 2021	3,990	3,000
March 2021	6,470	1,250
April 2021	5,190	4,000

Required:

Calculate:

- (a) (i) The mean sales of each outlet. (2 marks)
- (ii) The standard deviation of sales in each outlet. (4 marks)
- (iii) The median for each outlet. (2 marks)
- (iv) The range of sales for each outlet. (2 marks)
- (v) The coefficient of variation. (2 marks)
- (b) Using the calculations in (a) (i) – (a) (v) above, compare the performance of the two outlets. (2 marks)
- (c) Benson Munyasia sells 190 mobile phones at a total price of Sh.3,952,000. He makes a profit of 30% on the cost price of all mobile phones. The selling price per mobile phone is the same for each mobile phone.

Required:

- (i) The cost price for all the mobile phones. (2 marks)
- (ii) Average cost per mobile phone. (1 mark)
- (iii) Selling price per mobile phone. (1 mark)
- (iv) The number of mobile phones he must sell in order to make a profit of between Sh.150,000 and Sh.171,600. (2 marks)

(Total: 20 marks)

QUESTION THREE

- (a) Highlight three advantages and three disadvantages of using open-ended questions in a questionnaire. (6 marks)
- (b) The following is an extract of the number of days customers have taken to settle their accounts and the related number of accounts settled:

Number of days	Number of accounts
$4 \leq x \leq 8$	4
$8 \leq x \leq 12$	13
$12 \leq x \leq 16$	15
$16 \leq x \leq 20$	18
$20 \leq x \leq 24$	14
$24 \leq x \leq 28$	10
$28 \leq x \leq 32$	6

Required:

- (i) Construct a cumulative frequency curve for the number of days taken against number of accounts settled. (5 marks)
- (ii) Estimate the semi-interquartile range of the distribution. (2 marks)
- (iii) Estimate the percentage of customers who settle their accounts within 25 days. (1 mark)

- (c) John White, a Canadian tourist came to Kenya with 24,000 Sterling Pounds (£) and 5,000 United States Dollars (USD). He exchanged all his money to Kenya shillings paying a bank charge of 0.5%. He stayed in Kenya for 14 days, spending 60,000 Kenya Shillings (KES) per day on food, accommodation and sightseeing. He also incurred KES 1,500,000 to purchase artefacts and souvenirs to take back home.

At the end of his visit, John White purchased an airline ticket for KES.100,000 and converted the remaining money into Canadian Dollars (C\$), paying a bank charge of 1.5%. The prevailing exchange rates during his visit were as follows:

1 USD	= 102 KES
1 Sterling Pound (£)	= 151 KES
1 Canadian Dollar (C\$)	= 83 KES

Required:

The amount of money the tourist received at the end of his visit in Canadian Dollars (C\$). (6 marks)
(Total: 20 marks)

QUESTION FOUR

- (a) The following data shows the price in shillings and quantities in units of four commodities A, B, C and D:

Commodity	2019		2020	
	Price (Sh.)	Quantity (units)	Price (Sh.)	Quantity (units)
A	125	125	150	175
B	175	150	200	200
C	225	100	175	125
D	200	175	225	200

Required:

Using 2019 as the base year, calculate:

- (i) Laspeyre's quantity index. (4 marks)
- (ii) Paasche's quantity index. (4 marks)
- (iii) Fisher's quantity index. (2 marks)
- (b) Quick Fix Manufacturers Limited uses an automated process in its production line. The automated process is subject to breakdowns which are serviced by four technicians when they occur. The proportion of breakdowns serviced by the four technicians TP, TQ, TR and TS are 20%, 60%, 15% and 5% respectively. The probability of making an incomplete repair by TP and TS is 0.05 while the probability of making an incomplete repair by TQ and TR is 0.10.

A breakdown in the production line is diagnosed as being due to an initial repair that was incomplete.

Required:

- (i) A tree diagram showing the probability outcome of each technician. (5 marks)
- (ii) Calculate the probability that the initial repair was made by:
- TQ. (1 mark)
 - TP or TR. (2 marks)
 - TR and TS. (2 marks)

(Total: 20 marks)

QUESTION FIVE

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

- (i) Probability space. (2 marks)
- (ii) Mutually exclusive events. (2 marks)
- (iii) Random experiment. (2 marks)

(b) A market researcher in Kaza Town is investigating consumer preference for three beverages; coffee, tea and cocoa. He gathered the following information from a sample of 1,600 consumers:

- 460 took coffee.
- 490 took tea.
- 650 took cocoa.
- 60 took all the three beverages.
- 140 took coffee and cocoa.
- 220 took coffee only.
- 370 took cocoa only.

Required:

- (i) Present the above information in a Venn diagram. (3 marks)
- (ii) The number of customers who took tea only. (2 marks)
- (iii) The number of customers who took coffee and tea only. (2 marks)
- (iv) The number of customers who took tea and cocoa only. (2 marks)
- (v) The number of customers who took none of the beverages. (2 marks)

(c) Find the 12th term of the Arithmetic Progression (A.P):

-2, -4, -6, ... -100

(3 marks)

(Total: 20 marks)

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