KASNEB
ATD LEVEL II
DCM LEVEL II
BUSINESS MATHEMATICS AND STATISTICS

TUESDAY: 24 May 2016. 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 advantages and four disadvantages of closed-ended questions in a questionnaire. (8 marks)

(b) Bundacho Bakery, produces two types of cakes, namely; queen cake and blackforest. The cost of producing 10 queen cakes and 8 blackforest is Sh.4,060. The cost of producing 4 queen cakes and 7 blackforest is Sh.2,840. The bakery makes a mark-up of 20% and 30% on queen cakes and blackforest respectively.

Required:
(i) Using matrix algebra, determine the cost of producing a queen cake and a blackforest. (4 marks)

(ii) The selling price of a queen cake and a blackforest. (2 marks)

(c) James Wanigonda bought a television set on hire purchase terms. The deposit was indicated as Sh.35,000 and the balance payable in 12 equal instalments of Sh.4,500. As a policy of the company, a customer who defaults on an instalment is charged a penalty of 5% on the outstanding balance payable in the next month. James Wanigonda defaulted in the fifth month instalment and the ninth month instalment.

Required:
The total cost of the television set bought by James Wanigonda. (6 marks)
(Total: 20 marks)

QUESTION TWO
(a) Highlight three applications of break-even analysis in a business environment. (3 marks)

(b) In a certain manufacturing company, the total cost of production is given by the following function:

\[ TC = -3q^2 + 12q - 2 \]

where:
TC = Total Cost
q = Quantity produced in units.

The selling price per unit is Sh.5

Required:
(i) The revenue function. (1 mark)

(ii) The profit function. (2 marks)

(iii) The break-even point in units. (3 marks)

(iv) The level of production that would earn a profit of Sh.22,000. (3 marks)

(c) An international economic forum was attended by 190 invited guests from three continents namely; Africa, Asia and America.

The following information relates to the guests who attended the forum:

100 guests represented Africa.
80 guests represented Asia.

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90 guests represented America.  
35 guests represented both Africa and Asia.  
33 guests represented both Asia and America.  
48 guests represented both Africa and America.  
15 guests represented all the three continents.  

**Required:**  
(i) A venn diagram to represent the above information. (2 marks)  
(ii) The number of guests that were not representing any of the three continents. (2 marks)  
(iii) The number of guests that represented only one continent. (1 mark)  
(iv) The number of guests that represented two continents only. (1 mark)  
(v) The number of guests that represented at least two continents. (2 marks)  
(Total: 20 marks)

**QUESTION THREE**  
(a) Katama Insurance Company categorises its insurance claims by regions and the nature of claim as follows:

<table>
<thead>
<tr>
<th>Nature of claim</th>
<th>Eastern</th>
<th>Southern</th>
<th>Northern</th>
<th>Western</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor injuries treatment</td>
<td>75</td>
<td>128</td>
<td>29</td>
<td>52</td>
</tr>
<tr>
<td>In-patient treatment</td>
<td>233</td>
<td>514</td>
<td>104</td>
<td>251</td>
</tr>
<tr>
<td>Outpatient treatment</td>
<td>100</td>
<td>326</td>
<td>65</td>
<td>99</td>
</tr>
</tbody>
</table>

**Required:**  
Determine the probability that:  
(i) A claim chosen at random is from Northern region. (1 mark)  
(ii) A claim chosen at random is from Eastern region. (1 mark)  
(iii) A claim chosen at random is either from Northern region or Southern region. (2 marks)  
(iv) A claim chosen at random is for minor injuries treatment. (2 marks)  
(v) A claim chosen at random is from Southern region, given that it is for minor injuries treatment. (3 marks)  
(vi) A claim chosen at random is for outpatient treatment, given that it is from Western region. (3 marks)  

(b) The following data show the sales levels achieved by a salesman over a six month period together with the expenditure on fuel consumed over the same period:

<table>
<thead>
<tr>
<th>Month</th>
<th>Sales level (Sh. &quot;000&quot;)</th>
<th>Expenditure on fuel (Sh. &quot;000&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>250</td>
<td>30.00</td>
</tr>
<tr>
<td>February</td>
<td>180</td>
<td>20.00</td>
</tr>
<tr>
<td>March</td>
<td>315</td>
<td>30.25</td>
</tr>
<tr>
<td>April</td>
<td>225</td>
<td>27.50</td>
</tr>
<tr>
<td>May</td>
<td>345</td>
<td>28.75</td>
</tr>
<tr>
<td>June</td>
<td>500</td>
<td>42.60</td>
</tr>
</tbody>
</table>

**Required:**  
The coefficient of variation for:  
(i) Monthly sales level. (4 marks)  
(ii) Monthly expenditure on fuel. (4 marks)  
(Total: 20 marks)

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QUESTION FOUR
(a) Distinguish between the following terms:
   (i) Measures of central tendency and measures of dispersion. (4 marks)
   (ii) Nominal rate of interest and effective rate of interest. (4 marks)

(b) Agness Mwayano bought goods for sale worth Sh.90,000. She projected to make a profit of 25% on the selling price.
   Required:
   The price to be charged for the goods. (4 marks)

(c) The following data relate to the weekly output of production and the number of employees in a company:

<table>
<thead>
<tr>
<th>Weekly Output in units (&quot;000&quot;)</th>
<th>Number of employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 160</td>
<td>1</td>
</tr>
<tr>
<td>160 - 180</td>
<td>5</td>
</tr>
<tr>
<td>180 - 200</td>
<td>10</td>
</tr>
<tr>
<td>200 - 220</td>
<td>35</td>
</tr>
<tr>
<td>220 - 240</td>
<td>55</td>
</tr>
<tr>
<td>240 - 260</td>
<td>74</td>
</tr>
<tr>
<td>260 - 300</td>
<td>20</td>
</tr>
</tbody>
</table>

Required:
   (i) The arithmetic mean of the weekly output. (4 marks)
   (ii) The median weekly output. (4 marks)

(Total: 20 marks)

QUESTION FIVE
(a) The following are the indices of a country for the years 2011 - 2015:

<table>
<thead>
<tr>
<th>Year</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Index</td>
<td>108</td>
<td>114</td>
<td>106</td>
<td>118</td>
<td>122</td>
</tr>
</tbody>
</table>

Required:
   The constant base indices using 2010 as the base year (2010 = 100). (5 marks)

(b) The table below shows the number of services offered and prices charged per service for a small rural dental clinic during the last three quarters of year 2015:

<table>
<thead>
<tr>
<th>Type of Service</th>
<th>Price (Sh.)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>April-June</td>
<td>July-September</td>
<td>October-December</td>
<td>April-June</td>
<td>July-September</td>
<td>October-December</td>
<td></td>
</tr>
<tr>
<td>Tooth extraction</td>
<td>800</td>
<td>900</td>
<td>1,200</td>
<td>300</td>
<td>275</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Tooth filling</td>
<td>600</td>
<td>750</td>
<td>900</td>
<td>400</td>
<td>320</td>
<td>280</td>
<td></td>
</tr>
<tr>
<td>Tooth cleaning</td>
<td>450</td>
<td>600</td>
<td>800</td>
<td>700</td>
<td>660</td>
<td>800</td>
<td></td>
</tr>
</tbody>
</table>

Additional information:
   Base period = April - June

Required:
   (i) The Laspeyre's price indices for the quarters July - September and October - December. (8 marks)
   (ii) The Paasche's price indices for the quarters July - September and October - December. (7 marks)

(Total: 20 marks)

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