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22STU102N/22STU102

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2025
(First Semester)

Branch – **STATISTICS**

TIME SERIES & INDEX NUMBERS

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	What assumption involved in least squares method for estimating the trend (a) Nonlinear (b) Linear over time (c) Cyclic (d) Random	K1	CO1
	2	Which component of time series reflects a periodic fluctuations (a) Trend (b) Cyclical (c) Random (d) Seasonal	K2	CO1
2	3	Which method divides the current value of a time series by the corresponding trend value? (a) Simple Average (b) Ratio to Trend (c) Moving Average (d)Variate Difference	K1	CO2
	4	The Variate Difference Method is typically applied to detect (a) Cyclical variations (b) Seasonal patterns (c) Random components (d) Trends in time series	K2	CO2
3	5	The formula for a simple unweighted index number is based on (a) Quantities of base year (b) Prices only (c)A combination of prices and quantities (d) A weighted average of prices	K1	CO3
	6	An index number that measures changes in the quantity of goods produced over time is known as (a) Price index (b) Quantity index (c) Value index (d) Chain base index	K2	CO3
4	7	The Marshall-Edgeworth Index is an extension of (a) Fisher's index (b) Quantity index (c) Chain base index (d) Paasche's index	K1	CO4
	8	_____ is known as the "ideal" index number? (a) Paasche's index (b) Laspeyres index (c)Marshall Edgeworth index (d) Fisher's index	K2	CO4
5	9	The production method of calculating national income is also known as (a) Value-added method (b) Income method (c) Expenditure method (d) Output method	K1	CO5
	10	Which of the following is a challenge in measuring national income in India? (a) Large informal economy (b) Overestimation of public service (c) Perfect data collection (d) High tax rates	K2	CO5

Cont...

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

<table>
<tr><th>Module No.</th><th>Question No.</th><th>Question</th><th>K Level</th><th>CO</th></tr>
<tr><td rowspan="2">1</td><td>11.a.</td><td>Define time series and state its uses.</td><td rowspan="3">K3</td><td rowspan="3">CO1</td></tr>
<tr><td colspan="2">(OR)</td></tr>
<tr><td rowspan="2"></td><td>11.b.</td><td>The following figures provides the production information of a certain factory manufacturing air-conditioners:
<table>
<tr><td>Year</td><td>1990</td><td>1991</td><td>1992</td><td>1993</td><td>1994</td><td>1995</td></tr>
<tr><td>Production ('000units)</td><td>17</td><td>20</td><td>19</td><td>26</td><td>24</td><td>40</td></tr>
</table>
<table>
<tr><td>Year</td><td>1996</td><td>1997</td><td>1998</td><td>1999</td><td>2000</td></tr>
<tr><td>Production ('000units)</td><td>35</td><td>55</td><td>51</td><td>74</td><td>79</td></tr>
</table>
Fit the second-degree parabolic trend curve to the above data and obtain the trend values.</td></tr>
<tr><td>12.a.</td><td>Discuss the measurement of cyclical fluctuations in time series.</td><td rowspan="3">K2</td><td rowspan="3">CO2</td></tr>
<tr><td colspan="2">(OR)</td></tr>
<tr><td rowspan="2"></td><td>12.b.</td><td>Compute the seasonal indices by the 'Link Relatives' method for the adjoining data relating to the average quarterly prices (Rs. per kg) of a commodity for five years:
<table>
<tr><td>Year / Quarter</td><td>1996</td><td>1997</td><td>1998</td><td>1999</td><td>2000</td></tr>
<tr><td>I</td><td>30</td><td>35</td><td>31</td><td>31</td><td>34</td></tr>
<tr><td>II</td><td>26</td><td>28</td><td>29</td><td>31</td><td>36</td></tr>
<tr><td>III</td><td>22</td><td>22</td><td>28</td><td>25</td><td>26</td></tr>
<tr><td>IV</td><td>36</td><td>36</td><td>32</td><td>35</td><td>33</td></tr>
</table></td></tr>
<tr><td rowspan="3">3</td><td>13.a.</td><td>The price quotations of four different commodities for the year 2000 and 2005 are given in table. Calculate the index number for 2005 with 2000 as base year by using:
(i) the simple average of price relatives, and
(ii) the weighted average of price relatives
<table>
<tr><td rowspan="2">Commodity</td><td rowspan="2">Unit</td><td rowspan="2">Weight</td><td colspan="2">Price (in Rs.)</td></tr>
<tr><td>2000</td><td>2005</td></tr>
<tr><td>A</td><td>Kg.</td><td>5</td><td>20</td><td>45</td></tr>
<tr><td>B</td><td>Quintal</td><td>7</td><td>25</td><td>32</td></tr>
<tr><td>C</td><td>Dozen</td><td>6</td><td>30</td><td>45</td></tr>
<tr><td>D</td><td>Kg.</td><td>2</td><td>10</td><td>18</td></tr>
</table></td><td rowspan="3">K1</td><td rowspan="3">CO3</td></tr>
<tr><td colspan="2">(OR)</td></tr>
<tr><td>13.b.</td><td>Relate the chain base index numbers and obtain the fixed base index numbers:
<table>
<tr><td>Year</td><td>2000</td><td>2001</td><td>2002</td><td>2003</td><td>2004</td><td>2005</td></tr>
<tr><td>Chain indices</td><td>105</td><td>75</td><td>71</td><td>105</td><td>95</td><td>90</td></tr>
</table></td></tr>
</table>

<table>
<tr><td rowspan="3">4</td><td>14.a.</td><td colspan="2">Elucidate the construction of cost-of-living index number and list out its uses.</td><td rowspan="3">K3</td><td rowspan="3">CO4</td></tr>
<tr><td colspan="2">(OR)</td></tr>
<tr><td>14.b.</td><td colspan="2">From the following data calculate price index numbers for 2005 with 1995 as base year by: (i) Laspeyre's, (ii) Paasche's, (iii) Marshal – Edgeworth Methods.
<table>
<tr><th rowspan="2">Commodities</th><th colspan="2">1995</th><th colspan="2">2005</th></tr>
<tr><th>Price</th><th>Quantity</th><th>Price</th><th>Quantity</th></tr>
<tr><td>A</td><td>20</td><td>8</td><td>40</td><td>6</td></tr>
<tr><td>B</td><td>50</td><td>10</td><td>60</td><td>5</td></tr>
<tr><td>C</td><td>40</td><td>15</td><td>50</td><td>15</td></tr>
<tr><td>D</td><td>20</td><td>20</td><td>20</td><td>25</td></tr>
</table></td></tr>
<tr><td>5</td><td>15.a.</td><td colspan="2">Define national income and explain its importance in the context of a country's economic growth.</td><td rowspan="3">K1</td><td rowspan="3">CO5</td></tr>
<tr><td></td><td colspan="2">(OR)</td></tr>
<tr><td></td><td>15.b.</td><td colspan="2">Spell out the difficulties in estimating national income in India's agricultural sector.</td></tr>
</table>

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

<table>
<tr><th>Module No.</th><th>Question No.</th><th>Question</th><th>K Level</th><th>CO</th></tr>
<tr><td>1</td><td>16</td><td>Explain how the principle of least squares method is used to estimate trend in a time series data.</td><td>K5</td><td>CO1</td></tr>
<tr><td>2</td><td>17</td><td>Elucidate the procedure to construct seasonal indices by the 'ratio to moving average method'.</td><td>K6</td><td>CO2</td></tr>
<tr><td>3</td><td>18</td><td>Construct the wholesale price index number for the year 2004 and 2005 from the data given in below using 2003 as the base year.
<table>
<tr><th rowspan="2">Commodity</th><th colspan="3">Wholesale price (in '00 Rs) per quintal</th></tr>
<tr><th>2003</th><th>2004</th><th>2005</th></tr>
<tr><td>A</td><td>140</td><td>160</td><td>190</td></tr>
<tr><td>B</td><td>120</td><td>130</td><td>140</td></tr>
<tr><td>C</td><td>100</td><td>105</td><td>108</td></tr>
<tr><td>D</td><td>75</td><td>80</td><td>90</td></tr>
<tr><td>E</td><td>250</td><td>270</td><td>300</td></tr>
<tr><td>F</td><td>400</td><td>420</td><td>450</td></tr>
</table></td><td>K6</td><td>CO3</td></tr>
<tr><td>4</td><td>19</td><td>For the following commodity, calculate the cost of living index number for the year 2000 by using geometric mean method.
<table>
<tr><th rowspan="2">Commodity</th><th colspan="2">Price</th><th rowspan="2">Weight</th></tr>
<tr><th>1990</th><th>2000</th></tr>
<tr><td>Food</td><td>60</td><td>108</td><td>40</td></tr>
<tr><td>Clothing</td><td>50</td><td>94</td><td>17</td></tr>
<tr><td>Fuel & lighting</td><td>40</td><td>65</td><td>13</td></tr>
<tr><td>House Rent</td><td>125</td><td>225</td><td>27</td></tr>
<tr><td>Miscellaneous</td><td>120</td><td>240</td><td>3</td></tr>
</table></td><td>K5</td><td>CO4</td></tr>
<tr><td>5</td><td>20</td><td>Describe the three primary methods used for estimating national income.</td><td>K6</td><td>CO5</td></tr>
</table>

Z-Z-Z END