

**PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)**

**BSc DEGREE EXAMINATION DECEMBER 2024
(First Semester)**

Branch - STATISTICS

TIME SERIES AND 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	The trend fitting method which assumes a constant slope and intercept over time is (a) Exponential smoothing (b) Polynomial trend fitting (c) Least squares linear trend fitting (d) Moving average method	K1	CO1
	2	Which of the following component is responsible for the irregular fluctuations in time series data? (a) Trend (b) Seasonal variation (c) Cyclical variation (d) Random variation	K2	CO1
2	3	Which method involves calculating the seasonal index by averaging the values in each season? (a) Ratio to Trend (b) Simple Average (c) Moving Average (d) Link Relative	K1	CO2
	4	Cyclical fluctuations in time series are often linked to (a) Economic cycles (b) weather patterns (c) Random variations (d) fixed seasonal intervals	K2	CO2
3	5	Which of the following is the most commonly used index number in economics? (a) Consumer Price Index (CPI) (b) Wholesale Price Index (WPI) (c) Chain Base Index (d) Unweighted Index Number	K1	CO3
	6	Which index number gives more importance to recent price changes by adjusting the base year annually? (a) Fixed Base Index (b) Chain Base Index (c) Laspeyres' Index (d) Paasche's Index	K2	CO3
4	7	Which of the following is a test for an ideal index number? (a) Time Reversal Test (b) Quantity Test (c) Inflation Test (d) Stability Test	K1	CO4
	8	_____ is used to measure the cost of living over time? (a) Wholesale Price Index (WPI) (b) Consumer Price Index (CPI) (c) Paasche's Index (d) Laspeyre's Index	K2	CO4

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5	9	National income refers to the total (a) Income earned by a country's residents (b) Wealth of a nation (c) Output of goods and services in a country (d) Value of natural resources	K1	CO5
	10	Which of the following is a method of estimating national income? (a) Expenditure method (b) Savings method (c) Market method (d) Deflation method	K2	CO5

SECTION - B (35 Marks)

Answer ALL questions

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

Module No.	Question No.	Question	K Level	CO																														
1	11.a.	Explain briefly the additive and multiplicative model of time series.	K3	CO1																														
	(OR)																																	
	11.b.	Determine the seasonal fluctuations in time series given below by the method of moving average. <table><tr><th>Year</th><th>Quarter I</th><th>Quarter II</th><th>Quarter III</th><th>Quarter IV</th></tr><tr><td>1951</td><td>30</td><td>81</td><td>62</td><td>119</td></tr><tr><td>1952</td><td>33</td><td>104</td><td>86</td><td>171</td></tr><tr><td>1953</td><td>42</td><td>133</td><td>99</td><td>221</td></tr><tr><td>1954</td><td>56</td><td>172</td><td>129</td><td>335</td></tr><tr><td>1955</td><td>67</td><td>201</td><td>136</td><td>302</td></tr></table>	Year	Quarter I	Quarter II	Quarter III	Quarter IV	1951	30	81	62	119	1952	33	104	86	171	1953	42	133	99	221	1954	56	172	129	335	1955	67	201	136	302		
Year	Quarter I	Quarter II	Quarter III	Quarter IV																														
1951	30	81	62	119																														
1952	33	104	86	171																														
1953	42	133	99	221																														
1954	56	172	129	335																														
1955	67	201	136	302																														
2	12.a.	Mention the steps involved in Link Relative method																																
	(OR)																																	
	12.b.	Using Ratio to Trend method, determine the quarterly seasonal indices for the adjoining data. <table><tr><th>Year</th><th>I Qrt.</th><th>II Qrt.</th><th>III Qrt.</th><th>IV Qrt.</th></tr><tr><td>1995</td><td>30</td><td>40</td><td>36</td><td>34</td></tr><tr><td>1996</td><td>34</td><td>52</td><td>50</td><td>44</td></tr><tr><td>1997</td><td>40</td><td>58</td><td>54</td><td>48</td></tr><tr><td>1998</td><td>54</td><td>76</td><td>68</td><td>62</td></tr><tr><td>1999</td><td>80</td><td>92</td><td>86</td><td>82</td></tr></table>	Year	I Qrt.	II Qrt.	III Qrt.	IV Qrt.	1995	30	40	36	34	1996	34	52	50	44	1997	40	58	54	48	1998	54	76	68	62	1999	80	92	86	82	K2	CO2
Year	I Qrt.	II Qrt.	III Qrt.	IV Qrt.																														
1995	30	40	36	34																														
1996	34	52	50	44																														
1997	40	58	54	48																														
1998	54	76	68	62																														
1999	80	92	86	82																														
3	13.a.	Define index numbers and state its uses																																
	(OR)																																	
	13.b.	The price quotations of four different commodities for 2000 and 2005 are given in table below. Calculate the index number for 2005 with 2000 as base by using: (i) the simple average of price relatives, and (ii) the weighted average of price relatives <table><tr><th rowspan="2">Commodity</th><th rowspan="2">Unit</th><th rowspan="2">Weight</th><th colspan="2">Price (in Rs.)</th></tr><tr><th>2000</th><th>2005</th></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>			Commodity	Unit	Weight	Price (in Rs.)		2000	2005	A	Kg.	5	20	45	B	Quintal	7	25	32	C	Dozen	6	30	45	D	Kg.	2	10	18	K1	CO3	
Commodity	Unit	Weight	Price (in Rs.)																															
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D	Kg.	2	10	18																														

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4	14.a.	Explain the tests for ideal index numbers				K3	CO4
	(OR)						
	14.b.	Compute price index and quantity index numbers for the year 2005 with 2000 as base year, using (i) Laspeyre's Method (ii) Paasche's Method (iii) Fisher's Method					
		Commodity	Quantity (units)		Expenditure (Rs.)		
2000			2005	2000	2005		
A		100	150	500	900		
B		80	100	320	500		
C	60	72	150	360			
D	30	33	360	297			
5	15.a.	What is per capita income? Discuss its significance in assessing the standard of living in a country.				K1	CO5
	(OR)						
	15.b.	How can national income estimates be used to measure the economic development of a country? Give examples.					

SECTION -C (30 Marks)Answer **ANY THREE** questions**ALL** questions carry **EQUAL** Marks

(3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO																																
1	16	Briefly explain the components of time series.	K5	CO1																																
2	17	Explain the variate difference method for obtaining the variance of the random component in a time series.	K6	CO2																																
3	18	Show that for the following series of fixed base index numbers, the chain indices are same as fixed base index numbers: <table><tr><td>Year</td><td>1995</td><td>1996</td><td>1997</td><td>1998</td><td>1999</td><td>2000</td></tr><tr><td>Index No.</td><td>100</td><td>120</td><td>122</td><td>116</td><td>120</td><td>120</td></tr><tr><td>Year</td><td>2001</td><td>2002</td><td>2003</td><td>2004</td><td>2005</td><td></td></tr><tr><td>Index No.</td><td>137</td><td>136</td><td>149</td><td>156</td><td>137</td><td></td></tr></table>	Year	1995	1996	1997	1998	1999	2000	Index No.	100	120	122	116	120	120	Year	2001	2002	2003	2004	2005		Index No.	137	136	149	156	137		K6	CO3				
Year	1995	1996	1997	1998	1999	2000																														
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Year	2001	2002	2003	2004	2005																															
Index No.	137	136	149	156	137																															
4	19	For the data in the following table, construct the cost of living index for the year 2005 (Base 2001= 100) using method of weighted price relatives <table><tr><th rowspan="2">Item</th><th rowspan="2">Unit</th><th colspan="2">Price (in Rs.)</th><th rowspan="2">Weight</th></tr><tr><th>2001</th><th>2005</th></tr><tr><td>A</td><td>Kg.</td><td>50</td><td>75</td><td>10%</td></tr><tr><td>B</td><td>Liter</td><td>60</td><td>75</td><td>25%</td></tr><tr><td>C</td><td>Dozen</td><td>200</td><td>240</td><td>20%</td></tr><tr><td>D</td><td>Kg.</td><td>80</td><td>100</td><td>40%</td></tr><tr><td>E</td><td>One pair</td><td>160</td><td>200</td><td>5%</td></tr></table>	Item	Unit	Price (in Rs.)		Weight	2001	2005	A	Kg.	50	75	10%	B	Liter	60	75	25%	C	Dozen	200	240	20%	D	Kg.	80	100	40%	E	One pair	160	200	5%	K5	CO4
Item	Unit	Price (in Rs.)			Weight																															
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B	Liter	60	75	25%																																
C	Dozen	200	240	20%																																
D	Kg.	80	100	40%																																
E	One pair	160	200	5%																																
5	20	Illustrate the expenditure method for calculating national income. What are its major components, and how is it applied in practical terms?	K6	CO5																																