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CORE CONCEPT OF

BUSINESS MATHMATICS & STATISTICS

1. Illustrate the Index Number.
2. Briefly describe the characteristics of index number.
3. What do you mean by purpose of index number?

Example-20: Compute Laspeyre's, Paasche's, Marshall-Edge worth's, Dorbish Bowley's, Fisher's Ideal Index Number. Also satisfy the test from the following data:

	Base Year		Current Year	
Items	**Price**	**Expenditure (value)**	**Price**	**Expenditure(value)**
A	10	100	12	144
B	15	75	20	120
C	8	80	10	110
D	20	60	25	50
E	50	500	60	540

Solution-20:

	Base Year		Current Year		q0	q1	p_0q_0	p_0q_1	p_1q_0	p_1q_1
Items	**p0**	**(value)**	**p1**	**(value)**						
A	10	100	12	144	10	12	100	120	120	144
B	15	75	20	120	5	6	75	90	100	120
C	8	80	10	110	10	11	80	88	100	110
D	20	60	25	50	3	2	60	40	75	50
E	50	500	60	540	10	9	500	450	600	540
							Σ Poq0 815	Σ P0q1 788	Σ p1q0 995	Σ p1q1 964

1) Laspeyre's Method:(P_{01}) = $\left[\frac{\Sigma P1q0}{\Sigma Poq0} * 100\right]$

$$(P_{01}) = \left[\frac{995}{815} * 100\right] = 1.221*100 = 122.09$$

2) **Paasche's Method:** $(P_{01}) = \left[\frac{\Sigma P1q1}{\Sigma Poq1} * 100\right]$

$$(P_{01}) = \left[\frac{964}{788} * 100\right] = 1.2234*100 = 122.34$$

3) **Marshall-Edge worth's Method:** $(P_{01}) = \left[\frac{\Sigma P1q0+\Sigma p1q1}{\Sigma Poq0+\Sigma P0q1} * 100\right]$

$$(P_{01}) = \left[\frac{995+964}{815+788} * 100\right]$$

$$(P_{01}) = \left[\frac{1959}{1603} * 100\right] = 1.222*100 = 122.2$$

4) **Dorbish Bowley's Method-** $(P_{01}) = \left[\frac{\Sigma P1q0}{\Sigma Poq0} + \frac{\Sigma P1q1}{\Sigma Poq1}\right] * 100/2$

$$(P_{01}) = \left[\frac{995}{815} + \frac{964}{788}\right] * 50$$

$$(P_{01}) = [1.221+1.223]*50$$

$$(P_{01}) = [2.444]*50 = 122.2$$

5) **Fisher's Index Number =** $(P_{01}) = \sqrt{\frac{\Sigma P1q0}{\Sigma Poq0} * \frac{\Sigma P1q1}{\Sigma Poq1}} * 100$

$$(P_{01}) = \sqrt{\frac{995}{815} * \frac{964}{788}} * 100$$

$$(P_{01}) = \sqrt{1.221 * 1.223} * 100$$

$$(P_{01}) = \sqrt{1.493283} * 100$$

$$(P_{01}) = 1.22*100 = 122$$

Reversibility Tests-

1) **Time Reversibility test**.

$$\mathbf{P_{01} * P_{10} = 1}$$

Fisher's ideal index number satisfies this test as explained below:

$\mathbf{(P_{01})} = \sqrt{\frac{\Sigma P1q0}{\Sigma Poq\,0} * \frac{\Sigma P1q1}{\Sigma Poq\,1}} * 100$ or $\mathbf{(P_{10})} = \sqrt{\frac{\Sigma P0q0}{\Sigma P1q0} * \frac{\Sigma P0q1}{\Sigma P1q1}} * 100$

Thus, $\mathbf{P_{01} \times P_{10}} = \sqrt{\frac{\Sigma P1q0}{\Sigma Poq\,0} * \frac{\Sigma P1q1}{\Sigma Poq\,1} * \frac{\Sigma P0q0}{\Sigma P1q0} * \frac{\Sigma P0q1}{\Sigma P1q1}}$

$\mathbf{P_{01} \times P_{10}} = \sqrt{\frac{995}{815} * \frac{964}{788} * \frac{815}{995} * \frac{788}{964}} = \sqrt{1}$

$\mathbf{P_{01} \times P_{10}} = 1$

2) **Factor Reversibility Test-** $\mathbf{P_{01} * Q_{01} = \frac{\Sigma P1q1}{\Sigma Poq0}}$

Fisher's formula satisfies also this test as explained below:

$\mathbf{(P_{01})} = \sqrt{\frac{\Sigma P1q0}{\Sigma Poq\,0} * \frac{\Sigma P1q1}{\Sigma Poq\,1}} * 100$ $Q_{01} = \sqrt{\frac{\Sigma q1p0}{\Sigma qop\,0} * \frac{\Sigma q1p1}{\Sigma qop\,1}} * 100$

$\mathbf{P_{01} * Q_{01}} = \sqrt{\frac{\Sigma P1q0}{\Sigma Poq\,0} * \frac{\Sigma P1q1}{\Sigma Poq\,1} * \frac{\Sigma q1p0}{\Sigma q0p0} * \frac{\Sigma q1p1}{\Sigma q0p1}}$

$\mathbf{P_{01} * Q_{01}} = \sqrt{\frac{995}{815} * \frac{964}{788} * \frac{788}{815} * \frac{964}{995}}$

$\mathbf{P_{01} * Q_{01}} = \sqrt{\frac{964}{815} * \frac{964}{815}}$

$\mathbf{P_{01} * Q_{01}} = \mathbf{\frac{964}{815} = 1.183}$