

**PUNJAB PUBLIC SERVICE COMMISSION
COMBINED COMPETITIVE EXAMINATION
FOR RECRUITMENT TO THE POSTS OF
PROVINCIAL MANAGEMENT SERVICE, ETC.**

STATISTICS (OPTIONAL) PAPER-II

TIME ALLOWED: 3 HOURS

MAXIMUM MARKS: 100

Note: Attempt any FIVE questions. Answer should be supported by working. Simple calculator is allowed.

- Q.1:** (a) Differentiate between Probability sampling and Non-probability sampling. Describe in brief various Probability sampling and Non-probability sampling techniques.
- (b) In 30 tosses of a coin the following sequence of heads (H) is obtained: H T T H T H H H T H H T T H T H T H H T H T H T H H T H T. Determine the number of runs. Test at 0.05 significance level whether the sequence is random. (15,5)

- Q.2:** (a) Describe in brief the properties of a good estimator.
- (b) Table 1 shows the number of bags (hundreds of sugar sold by a certain dealer). Compute the seasonal indices by using the ratio to moving average method.

Years	Quarters			
	I	II	III	IV
2001	77	103	84	111
2002	84	127	106	148
2003	99	146	134	165
2004	130	148	140	192

- Q.3:** (a) Table 2 gives the results of a study involving marital status and net worth (in thousands \$). Check the association between the two attributes.

Net worth	married	single	widow
100-249	28	20	22
250-499	15	17	18
500-999	12	8	10
1000 or more	9	7	9

Table of chi-square (Right tail area is 0.05)

df	1	2	3	4	5	6	7	8	9	10	11	12
Chi-square	3.841	5.991	7.815	9.488	11.070	12.592	14.067	15.507	16.919	18.307	19.675	21.026

- (b) Describe in brief the working of Federal Bureau of Statistics of Pakistan. (15, 5)

- Q.4:** (a) A farmer wishes to test the effects of four different fertilizer (A, B, C and D) on the yield of wheat. In order to eliminate sources of error due to variability in soil fertility, he uses the fertilizers in a Latin-square arrangement, as shown in Table 3, where the numbers indicate yields in bushels per unit area. Perform an analysis of variance to determine whether there is a difference between the fertilizers at significance levels of 0.05.

I	II	III	IV
77	103	84	111
84	127	106	148
99	146	134	165
130	148	140	192

Table of F (Right tail area is 0.05)

		df1										
		1	2	3	4	5	6	7	8	9	10	
df2												
1		161.5	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	
2		18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	
3		10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	
4		7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	
5		6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	
6		5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	
7		5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	
8		5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	
9		5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	
10		4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	
11		4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	
12		4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	
13		4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	
14		4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	
15		4.54	3.68	3.29	3.06	2.90	2.89	2.71	2.64	2.59	2.54	

- (b) Describe in brief application of statistics in economic development of Pakistan. (15, 5)

- Q.5:** (a) What are the vital events? Explain the source of demographic data in Pakistan.
- (b) Find the chain indices from the price relative (Table 4) of four commodities using the geometric mean of relatives for each year.

Year	Commodities		
	A	B	C
2001	81	77	119
2002	62	54	128
2003	104	87	111
2004	93	78	154

- Q.6:** (a) Throw light on the working of Major Statistical Organisations in Pakistan. What are the main sources of Statistical data in Pakistan.
- (b) How statistical data can be helpful in the field of Public Health, Crime Prevention and Social Innovation? Elaborate. (10, 10)

- Q.7:** (a) What are the key problems faced in the construction of Index Number. Give some relevant examples.
- (b) Explain some theoretical tests for Index Numbers. (10, 10)