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(8 pages) Reg. No. :.....

Code No. : 20429 E **Sub. Code : CAST 21**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2023.

Second/ Fourth Semester

Mathematics — Allied

STATISTICS – II

(For those who joined in July 2021-2022)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. Bowley's index number is

(a) $\frac{1}{2}\left[\frac{\sum p_1 q_0}{\sum p_0 q_0} + \sum \frac{p_1 q_1}{\sum p_0 q_1}\right] \times 100$

(b) $\left[\sum \frac{p_1 q_0}{\sum p_0 q_0} + \sum \frac{p_1 q_1}{p_0 q_1}\right] \times 100$

(c) $\frac{1}{2}\left[\frac{\sum p_1 q_0}{\sum p_0 q_0} + \frac{\sum p_1 q_1}{\sum p_0 q_1}\right]$

(d) $\frac{1}{2}\left[\frac{p_1 q_0}{p_0 q_0} + \frac{\sum p_1 q_1}{\sum p_0 q_1}\right] \times 100$

2. The factor reversal test is $I_{pq} \times I_{qp} =$ ————

(a) $\frac{\sum p_1 q_0}{\sum p_0 q_1}$ (b) $\frac{\sum p_1 q_0}{\sum p_1 q_1}$

(c) $\frac{\sum p_1 q_1}{\sum p_0 q_1}$ (d) $\frac{\sum p_1 q_1}{\sum p_0 q_0}$

3. Large simple theory is applicable when N is ——

(a) < 30 (b) > 30

(c) atleast 100 (d) None

4. The standard deviation of the sampling distribution of a statistic is known as ————.

(a) normal error (b) standard error

(c) type I error (d) type II error

5. Students t-distribution was discovered by ————

(a) Karl Pearson (b) Laplace

(c) Fisher (d) None

6. Test for equality of two means for large samples is based on

(a) t-distribution

(b) Chi-square distribution

(c) F-distribution

(d) Normal distribution

7. In a Latin square design the number of rows, columns and treatments are

(a) all different

(b) always equal

(c) non necessarily equal

(d) none

8. Latin squares are most widely used in ————.

(a) Agriculture (b) Industry

(c) Medicine (d) Astronomy

9. In a control chart the upper control limit can be ————.

(a) Always positive (b) Negative

(c) Always zero (d) None

10. The originator of S.Q.C is ————.

(a) Shewart (b) Karl Pearson

(c) Kelly (d) Paashe

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Show that the Fisher's index number is an ideal index number.

Or

(b) Explain

(i) Bowley's Index number

(ii) Fisher's Index number

(iii) Kelly's Index number

12. (a) A coin is tossed 144 times and a person gets 80 heads. Can we say that the coin is unbiased one?

Or

(b) Define : Type I error and Type II error.

13. (a) Explain t-distribution.

Or

(b) Prove that $\chi^2 = \sum_{i=1}^{k} \frac{(o_i - e_i)^2}{e_i} = \sum_{i=1}^{k} \frac{o_i^2}{e_i} - n$

Where there are k set of theoretical and observed values with the total freq n.

14. (a) Describe the technique of an analysis of variance with an illustration for a one way classification.

Or

(b) Prove that $\sum_{i=1}^{k}\sum_{j=1}^{n_j}(x_{ij}-\bar{x}_{..})^2 = \sum_{i=1}^{k}\sum_{j=1}^{n_j}x_{ij}^2 - \frac{T^2}{N}$

15. (a) Describe the construction of mean chart and its uses.

Or

(b) Describe the construction of *P*-chart.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Construct index numbers of price from the following data by using :

(i) Laspeyre's method

(ii) Paashe's method

(iii) Bowley's method

	2014		2016	
Commodities	Price	Quantity	Price	Quantity
A	2	8	4	6
B	5	10	6	5
C	4	14	5	10
D	2	19	2	13

Or

(b) Find the missing price in the following data if the ratio between Laspeyre's and Paasche's index numbers is 25 : 24.

Commodities	Base Year		Current Year	
	Price	quntity	Price	quantity
A	1	15	2	15
B	2	15	–	30

17. (a) A dice is thrown 9000 times and a throw of 3 or 4 observed 3240 times. Show that the dice cannot the regarded as an unbiased one and find the limits between which the probability of a throw of 3 or 4 less?

Or

(b) In two large populations, there are 30% and 25% respectively of blue eyed people. Is this difference likely to be hidden in samples 1200 and 900 respectively from the populations?

18. (a) A random sample of 10 boys has the following I.Q. (Intelligent Quotients). 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q. of 100?

Or

(b) Two random samples gave the following results.

Sample	Size	Sample mean	Sum of squares of deviations from the mean
1	10	15	90
2	12	14	108

Test whether they come from the same normal populations.

19. (a) Analyse the variance in the following Latin square.

A8	C18	B9
C9	B18	A16
B11	A10	C20

Or

(b) Three varities of cows of same age group are treated with four different types of fodders. The yields of milk in deciliters are given below. Perform an analysis of variance and check whether there is any significant difference between the yields of different varities of cows due to different types of fodders.

Varieties of cows	Fodders			
	f_1	f_2	f_3	f_4
C_1	61	63	66	68
C_2	62	64	67	69
C_3	63	63	68	69

20. (a) Explain the principle of C-chart and R-chart.

Or

(b) 20 pieces of cloth out of different rolls contained respectively 1, 4, 3, 2, 4, 5, 6, 7, 2, 3, 2, 5, 7, 6, 4, 5, 2, 1, 3 and 8 imperfections ascertain whether the process is in a state of statistical control.

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