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

Second/Fourth Semester

Mathematics — Allied

STATISTICS — II

(For those who joined in July 2017-2020)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. Paasche's index number is

(a)  $\frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$       (b)  $\frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100$

(c)  $\frac{\sum p_1 q_1}{\sum p_0 q_0} \times 100$       (d)  $\frac{\sum p_0 q_0}{\sum p_1 q_1} \times 100$

2. Fisher's index number is

- (a) arithmetic mean of Laspeyre's and Paasche's index  
(b) median of Laspeyre's and Paasche's index  
(c) harmonic mean of Laspeyre's and Paasche's index  
(d) geometric mean of Laspeyre's and Paasche's index

3. 5% level of significance is

(a)  $\mu \pm \frac{2\sigma}{\sqrt{n}}$       (b)  $\mu \pm 2.58 \frac{\sigma}{\sqrt{n}}$

(c)  $\mu \pm 1.96 \frac{\sigma}{\sqrt{n}}$       (d)  $\mu \pm \frac{\sigma}{\sqrt{n}}$

4. The standard error of the statistic  $p$  (sample proportion) is

(a)  $\sqrt{\frac{n}{PQ}}$       (b)  $\sqrt{\frac{PQ}{n}}$

(c)  $PQ\sqrt{\frac{1}{n}}$       (d)  $\frac{1}{n}\sqrt{PQ}$

5. The test statistic for  $F$ -distribution is

(a)  $\frac{S_X^2}{S_Y^2}$       (b)  $\frac{S_Y^2}{S_X^2}$

(c)  $S_X^2 S_Y^2$       (d)  $S_X S_Y$

6. When expected and observed frequency completely coincide chi-square will be

- (a) 0 (b) +1  
(c) -1 (d) greater than 2

7. The number of degrees of freedom in a  $3 \times 3$  contingency table is

- (a) 8 (b) 9  
(c) 4 (d) 1

8. Which of the following is a  $2 \times 2$  Latin square?

- (a) A A (b) A B  
B B B A  
(c) B A (d) A B  
B A A B

9. The R-chart is used to show \_\_\_\_\_ of the quality produced by the given process.

- (a) variability (b) range  
(c) sample range (d) standard deviation

10. Which of the following is not an advantages of statistical quality control

- (a) Reduction in cost (b) Greater efficiency  
(c) Easy to apply (d) Minimum waste

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PART B — (5 × 5 = 25 marks)

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

11. (a) Describe the characteristics of index numbers.

Or

(b) From the following data of wholesale price construct index numbers for 1991 and 1992 taking 1990 as base.

Commodity	Whole sales price in Rs. Per quintal		
	1990	1991	1992
A	700	750	825
B	540	575	600
C	300	325	310
D	250	280	295
E	320	330	335
F	325	350	360

12. (a) Explain the types of hypothesis.

Or

(b) The means of two single large samples of 1000 and 2000 members are 67.5 and 68 resp. Can the samples be regarded as drawn from the same population of standard deviation 2.5?

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[P.T.O.]

13. (a) Write the procedure of t-test for a single mean.

Or

- (b) For the following data, test whether this difference is significant or not.

Sample Size  $\Sigma(x - \bar{x})^2$

- (i) 8                      84.4  
(ii) 10                     102.6

5% of  $F$  for (7, 9) degrees of freedom is 3.29.

14. (a) The following table gives the results of experiments of 3 varieties of crops 4 in block of plots. Test the significance of difference between the yields of the 3 varieties by preparing the table of analysis of variance.

Variety	Plots			
A	8	4	6	7
B	7	5	5	3
C	2	5	4	4

Or

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

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Varieties of Cows	Fodders			
	f <sub>1</sub>	f <sub>2</sub>	f <sub>3</sub>	f <sub>4</sub>
C <sub>1</sub>	61	63	66	68
C <sub>2</sub>	62	64	67	69
C <sub>3</sub>	63	63	68	69

15. (a) Define P-chart and write its procedure.

Or

- (b) Explain : (i) LTPD (ii) AOQ

PART C — (5 × 8 = 40 marks)

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

16. (a) Explain about Ideal Index Number.

Or

- (b) For the following data calculate (i) Fishers (ii) Bowley's (iii) Marshall Edgeworth's index numbers.

Commodity	1990		1992	
	Price	Quantity	Price	Quantity
A	2	10	3	12
B	5	16	6.5	11
C	3.5	18	4	16
D	7	21	9	25
E	3	11	3.5	20

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17. (a) Describe the procedure to test the equality of population proportions.

Or

- (b) Two independent samples give the following results :

Size	Mean	Standard deviation
250	120	12
400	124	14

Test whether the difference between mean is significance or not.

18. (a) A survey of 800 families with four children each revealed the following distribution.

No. of boys:	0	1	2	3	4
No. of girls:	4	3	2	1	0
No. of families:	32	178	290	236	64

Is this result consistent with the hypothesis, that male and female births are equally probable?

Or

- (b) The following tables give the classification of 8000 graduates according to sex and employed. Test whether the employment is independent of the sex of the graduates.

	Employed	Non Employed	Total
Male	1480	5720	7200
Female	120	680	800
Total	1600	6400	8000

[Given 5% value of  $\chi^2$  (ith 1 d.f.) = 3.841]

19. (a) Describe ANOVA table for one way and two way classification of data.

Or

- (b) Perform ANOVA for the following Latin square.

A16	B10	C11	D9	E9
E10	C9	A14	B12	D11
B15	D8	E8	C10	A18
D12	E6	B13	A13	C12
C13	A11	D10	E7	B14

20. (a) Describe double sampling plan and its advantages.

Or

- (b) Construct  $\bar{X}$  chart for the following data :

Sample No.	1	2	3	4	5	6	7	8	9	10
$\bar{X}$	43	49	37	44	45	37	51	46	43	47
R	5	6	5	7	7	4	8	6	4	6

[Given  $A_2 = 0.577$ ]