Reg. No. : .....

Code No. : 20075 E **Sub. Code : SAST 21/ AAST 21**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Second/Fourth Semester

Mathematics — Allied

STATISTICS — II

(For those who joined in July 2017 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. The ———— mean of Laspeyre's and Paasche's index number is the Bowley's index number.

(a) arithmetic

(b) geometric

(c) harmonic

(d) none of the above

2. The ———— year is the period against which comprarision is made.
   (a) base
   (b) current
   (c) upcoming
   (d) none of the above

3. The standard error of $\bar{x}_1 - \bar{x}_2$ is ————
   (a) $\sqrt{\frac{\sigma^2}{2n}}$ (b) $\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n^2}}$
   (c) $\sqrt{\frac{\sigma_1^2}{2n_1} + \frac{\sigma_2^3}{2n_2}}$ (d) none of the above

4. The standard error of sample variance s^2 is ————
   (a) $\frac{\sigma}{\sqrt{n}}$ (b) $\sqrt{\frac{\sigma^2}{2n}}$
   (c) $\sigma^2\sqrt{\frac{2}{n}}$ (d) none of the above

5. F test is always ————
   (a) two tailed test
   (b) right - tailed test
   (c) left tailed test
   (d) none of the above

6. For the 2×2 contingency table

83	57
45	68

, the value of x^2 =
   (a) 10
   (b) 9
   (c) 9.48
   (d) none of the above

7. Analysis of variance (ANOVA) is developed by
   (a) Bowley
   (b) Kelley
   (c) Fisher
   (d) None of the above

8. The total degree of freedom for a random sample of N values is
   (a) $\frac{N}{2}$ (b) $2N$
   (c) $N - 1$ (d) None of the above

9. Control chart is developed by
   (a) Shewalt
   (b) Taylor
   (c) Euler
   (d) None of the above

10. The number of horizontal lines in the control chart is ————————

(a) 4 (b) 2

(c) 3 (d) none of the above

PART B — (5 × 5 = 25 marks)

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

11. (a) Calculate by the weight Aggrogate method, the index number from the following data.

Commodity	Base Year (Price per unit)	Current year Price per unit	Weight
Rice	30	40	10
Wheat	20	30	5
Pulses	40	50	6
Oil	35	40	5
Milk	40	50	10

Or

(b) Calculate peice index number for 1945 by (i) Bowley's method and (ii) Fisher's method.

Commodity	1935 Price in Rs.	1935 Quantity	1945 Price in Rs.	1945 Quantity
A	4	50	10	40
B	3	10	9	2
C	2	5	4	2

12. (a) A salesman in a departmental store claims that at most 60% of the shoppers entering the store leave without making a purchase. A random sample of 50 shoppers showed that 35 of them left without making a purchase. Is the sample result consistent with the claim of the salesman? Use a level of significance of 5%.

Or

(b) In a random sample of size 500, the mean is found to be 20. In another independent sample of size 400, the mean is 15. Could the sample have been drawn from the sample population with S.D. 4?

13. (a) The mean height and the S.D. height of 8 randomly chosen boy students are 166.9 cm and 8.29 cm respectively. The corresponding values of 6 randomly chosen girl students are 170.3 cm and 8.50 cm respectively. Based on this data, can we conclude that boy students are, in general, shorter than girl students. (t value for 12 d.f. = 1.782)

Or

(b) A certain injection administered to each of 12 patients resulted in the following change of blood pressure : 5, 2, 8, –1, 3, 0, 6, –2, 1, 5, 0, 4. Can it be concluded that the injection will, in general, result in increase of B.P? (t value = 1.80 for 11 d.f)

14. (a) Explain basic designs of experiment.

Or

(b) Four salesmen were posted in different areas by a company. The number of units of commodity X sold by them are as follows. On the basis of this information can it be concluded that there is a significant difference in the performance of the salesmen. $F_{(3,3)}$ $d.f = 3.24$

A	20	23	28	29
B	25	32	30	21
C	23	28	35	18
D	15	21	19	25

15. (a) The average number of defectives in 22 sample lots of 2,000 rubber belts was found to be 16%. Obtain the values for central line and control limits for p-chart.

Or

(b) Draw mean chart for the following 10 samples mean of size 5 each 43, 49, 37, 44, 45, 37, 51, 46, 43 and 47. Comment on the state of control of the process. ($n = 5$, $A_2 = 0.58$)

PART C — (5 × 8 = 40 marks)

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

16. (a) Construct (i) Chain Base Index (ii) Fixed Base Index taking 1993 as origin :

Year	Price (in Rs.) per quintal
1963	50
1964	60
1965	62
1966	65
1967	70
1968	78
1969	82
1970	84
1971	88
1972	90

Or

(b) The table below gives the princes of base year and current year of 5 commodities with their quantities. Use it to verify whether Fishere's index satisfies factor reversal test and time reversal test.

Commodity	Price year		Current year	
	Unit Price (Rs.)	Quantity	Unit Price (Rs.)	Quantity
A	5	50	5	70
B	5	75	10	80
C	10	80	12	100
D	5	20	8	100
E	10	50	5	60

17. (a) On the basis of their total scores, 200 candidates of a civil service examination are divided into two groups, the upper 30 percent and the remaining 70 percent. Consider the first question of this examination. Among the first group, 40 had the correct answer, whereas among the second group. 80 had the correct answer. On the basis of these results, can we conclude that the first question is no good at discriminating ability of the type being examined here.

Or

(b) Random samples drawn from two countries gave the following data relating to the heights of adult males.

	Country A	Country B
Mean height in inches	67.42	67.25
Standard deviation	2.58	2.50
Number in samples	1000	1200

(i) Is the difference between the means significant?

(ii) Is the difference between the standard deviations significant.

18. (a) Fit a poisson distribution to the following data and test the goodness of fit. Also given χ^2 for 2 d.f at 5% level of significance is 5.99.

x	0	1	2	3	4	5	6
f	275	72	30	7	5	2	1

Or

(b) A random sample of 10 boys had the following IQ's : 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q of 100. Find a reasonable range in which most of the mean IQ values of samples of 10 boys lie.

19. (a) Five types of treatments are given. The number average and standard deviation for each treatment are given in the following table. Test whether the treatments are homogeneous.

	A	B	C	D	E
Treatment No :	10	6	8	11	5
Mean :	10.9	13.5	11.5	11.2	15.4
Standard deviation :	12.72	5.96	3.24	5.65	3.64

Or

(b) Carry out analysis of variance for data of 7 varities, 5 observations being taken on each variety.

Variety No :	1	2	3	4	5	6	7
Observation No :							
1	13	15	14	14	17	15	16
2	11	11	10	10	15	9	12
3	10	13	12	15	14	13	13
4	16	18	13	17	19	14	15
5	12	12	11	10	12	10	12

20. (a) The following table gives the number of defective items found in 20 successive samples of 100 items each.

2 6 2 4 4 15 0 4 10 18

2 4 6 4 8 0 2 2 4 0

Comment whether the process is under control suggest suitable control limits for the future.

Or

(b) Ten pieces of cloth contained the following number of defects : 3, 0, 2, 8, 4, 2, 1, 3, 7, 1. Prepare a C-chart and state whether the production process is in a state of control.
