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Code No. : 30352 E      Sub. Code : SAST 21/  
AAST 21

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 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. Fisher's index number is \_\_\_\_\_ of Laspeyer's and Paasche's index number.  
(a) arithmetic mean      (b) geometric mean  
(c) harmonic mean      (d) none
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. 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

4. The sample is said to be large if its sample size exceeds \_\_\_\_\_.  
(a) 100      (b) 50  
(c) 40      (d) 30
5.  $t$ -distribution was done by \_\_\_\_\_.  
(a) W.S. Gosset      (b) Karl Pearson  
(c) R.A. Fisher      (d) Royden
6. The value of  $\chi^2$  range from \_\_\_\_\_.  
(a)  $-\infty$  to  $\infty$       (b) 0 to  $\infty$   
(c) -1 to 1      (d) 0 to 1
7. If  $k$  denotes number of rows and  $h$  denotes number of columns then the mean square value between the rows in two criteria of classification is \_\_\_\_\_.  
(a)  $\frac{v_1}{(k-1)}$       (b)  $\frac{v_2}{(h-1)}$   
(c)  $\frac{v_1}{(h-k)}$       (d)  $\frac{v_2}{(h-k)}$
8. In three criteria of classification the degrees of freedom between the rows is \_\_\_\_\_.  
(a)  $n$       (b)  $n-1$   
(c)  $(n-2)$       (d)  $(n-1)(n-2)$
9. S.Q.C techniques were developed by \_\_\_\_\_.  
(a) W.A. Shewhart      (b) A.L. Bowley  
(c) Karl Pearson      (d) Edgeworth
10. The Upper Control Limit for  $R$  chart is \_\_\_\_\_.  
(a)  $D_1 \bar{R}$       (b)  $D_2 \bar{R}$   
(c)  $D_3 \bar{R}$       (d)  $D_4 \bar{R}$

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PART B — (5 × 5 = 25 marks)

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

11. (a) Find the value of  $x$  in the following data if the ratio between Laspeyre's and Paasche's index number is 28:27.

Commodities	$p_0$	$q_0$	$p_1$	$q_1$
A	1	10	2	5
B	1	5	$x$	2

Or

- (b) From the following data construct an index number for 1970 taking 1969 as the base by price relatives method using (i) A.M (ii) G.M for averaging the relatives.

Commodities	Price in 1969	Price in 1970
	Rs.	Rs.
A	150	170
B	40	60
C	80	90
D	100	120
E	20	25

12. (a) A sample of 100 tyres is taken from a lot. The mean life of tyres is found to be 39,350 kms, with a standard deviation of 3,260. Could the sample come from a population with mean life of 40,000 kms? Establish 99% confidence limits within which the mean life of tyres is expected to lie.

Or

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- (b) Intelligence test on two groups of boys and girls gave the following results :

	Mean	S.D	N
Girls	75	15	150
Boys	70	20	250

Is there a significant difference in the mean scores obtained by boys and girls?

13. (a) A random sample of size 16 has 53 as mean. The sum of the squares of the deviations taken from mean is 135. Can this sample be regarded as taken from the population having 56 as mean?

Or

- (b) The mean life of a sample of 10 electric light bulbs was found to be 1456 hours with S.d of 423 hours. A second sample of 17 bulbs chosen from a different batch showed a mean life of 1280 hours with S.d of 398 hours. Is there a significant difference between the means of the two samples?

14. (a) The yields of 3 varieties of wheat in 3 blocks are given below. Is the difference between the varieties significant?

	Block	1	2	3
Variety				
A		10	9	8
B		7	7	7
C		8	5	4

Or

- (b) Write a short note on two criteria of classification.

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[P.T.O.]



15. (a) The following table gives the inspection data on completed spark plugs.

(2000 Spark plugs in 20 lots of 100 each)

Lot Number	Number Defectives	Fraction Defectives
1	5	0.050
2	10	0.100
3	12	0.120
4	8	0.080
5	6	0.060
6	5	0.050
7	6	0.060
8	3	0.030
9	3	0.030
10	5	0.050
11	4	0.040
12	7	0.070
13	8	0.080
14	2	0.020
15	3	0.030
16	4	0.040
17	5	0.050
18	8	0.080
19	6	0.060
20	10	0.100

Construct *p*-chart.

Or

- (b) Explain – Acceptance sampling.

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PART C — (5 × 8 = 40 marks)

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

16. (a) Calculate :

- (i) Laspeyre's (ii) Paasche's  
(iii) Bowley's (iv) Fisher's  
(v) Marshall's Edgeworth's

Index numbers for the following data given below

Commodity	Base Year		Current year	
	Price	Quantity	Price	Quantity
A	2	8	4	6
B	5	10	6	5
C	4	14	5	10
D	2	19	2	15

Or

- (b) Construct with a help of data given below. Fisher's index number and show that it satisfies both the factor reversal test and time reversal test

Commodity	A	B	C	D
Base year price in Rupees	5	6	4	3
Base year quantity in Quintals	50	40	120	30
Current year in Rupees	7	8	5	4
Current year quantity in Quintals	60	50	110	35

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

Or

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- (b) In a random sample of 1,000 persons from town A, 400 are found to be consumers of wheat. In a sample of 800 from town B, 400 are found to be consumers of wheat. Do these data reveal significant difference between town A and town B, so far, as the proportion of wheat consumers is concerned?

18. (a) Two random samples were drawn from two normal populations and their values are

A: 66 67 75 76 82 84 88 90 92

B: 64 66 74 78 82 85 87 92 93 95 97

Test whether the two populations have the same variance at the 5% level of the significance.

Or

- (b) In an experiment on pea-breeding Mendel obtained the following frequencies of seeds : 315 round and yellow, 101 wrinkled and yellow, 108 round and green, 32 wrinkled and green. According to his theory of heredity, the numbers should be in proportion 9:3:3:1. Is there any evidence to doubt the theory at 5% level of significance?

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

B20 C17 D25 A34

A23 D21 C15 B24

D24 A26 B21 C19

C26 B23 A27 D22

Or

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

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

20. (a) Construct  $\bar{X}$  and  $R$  charts for the following data.

Sample number	Observations			
1	32	37	42	
2	28	32	40	
3	39	52	28	
4	50	42	31	
5	42	45	34	
6	50	29	21	
7	44	52	35	
8	22	35	44	

Or

- (b) Explain control charts and its types.

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