

Reg. No. :

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M.Com. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2022.

First Semester

Commerce – Core

STATISTICS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer :

1. Skewness of normal distribution is _____
(a) negative (b) positive
(c) 0 (d) undefined
2. What is the probabilities of getting an even number when a dice is thrown?
(a) $1/6$ (b) $1/2$
(c) $1/3$ (d) $1/4$

3. Type 1 error occurs when?
 - (a) we reject H_0 if it is true
 - (b) we reject H_0 if it is false
 - (c) we accept H_0 if it is true
 - (d) we accept H_0 if it is false
4. A hypothesis which defines the population distribution is called?
 - (a) Null Hypothesis
 - (b) Statistical Hypothesis
 - (c) Simple Hypothesis
 - (d) Composite Hypothesis
5. The sign test assumes that the samples are
 - (a) Independent
 - (b) Dependent
 - (c) Have the same mean
 - (d) None of these
6. Compared to parametric methods, the non parametric methods are
 - (a) less accurate
 - (b) less efficient
 - (c) computationally easier
 - (d) (b) and (c) but not (a)

7. A decision tree considers the decision problems that involve
 - (a) a single stage
 - (b) multiple stage
 - (c) three stage
 - (d) a double stage
8. For regret criterion, the given payoff matrix is converted into _____
 - (a) rectangular payoff matrix
 - (b) opportunity loss
 - (c) diagonal payoff matrix
 - (d) new payoff matrix
9. Which among the following is a type of control chart for variables?
 - (a) C chart
 - (b) P chart
 - (c) \bar{X} chart
 - (d) U chart
10. LCC for the R chart is given by _____
 - (a) $D_3 \bar{R}$
 - (b) $D_2 \bar{R}$
 - (c) $F - D_3 \bar{R}$
 - (d) $d_2 \bar{R}$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) A sample of 3 items is selected at random from a box containing 12 items of which 3 are defective. Find the possible number of defective combinations of the said 3 selected items along with probability of a defective combination.

Or

- (b) An article manufactured by a company consists of two parts A and B. In the process of manufacture of part A, 9 out of 100 are likely to be defective. Similarly, 5 out of 100 are likely to be defective in the manufacture of part B. Calculate the probability that the assembled part will not be defective.

12. (a) Two samples of 100 electric bulbs each has a means 1500 and 1550, standard deviation 50 and 60. Can it be concluded that two brands differ significantly at 1% level of significance in equality.

Or

- (b) A random sample of 27 pairs of observations from a normal population gives a correlation co-efficient of 0.42. Is it likely that the variables in the population are un-correlated?

13. (a) In an anti malarial campaign in a certain area, quinine was administered to 812 persons out of a total population of 3,248. The number of fever cases is shown below.

Treatment	Fever	No Fever	Total
Quinine	20	792	812
No quinine	220	2216	2436
Total	240	3008	3248

Discuss the usefulness of quinine in checking malaria.

Or

- (b) Explain the advantages of non-parametric tests.

14. (a) What is statistical decision theory?

Or

- (b) Calculate the loss table from the following payoff table

		Payoff Table			
		Events			
Action	E ₁	E ₂	E ₃	E ₄	
A ₁	50	300	-150	50	
A ₂	400	0	100	0	
A ₃	-50	200	0	100	
A ₄	0	300	300	0	

Suppose that the probabilities of the events in this table are: $P(E_1) = 0.15$, $P(E_2) = 0.45$, $P(E_3) = .25$, $P(E_4) = 0.15$. Calculate the expected payoff.

15. (a) Discuss the use of statistical quality control.

Or

- (b) If the average fraction defective of large sample of products is 0.1537. Calculate the control limits.

(Given that sub-group size is 2,000)

What modification do you need if the sub-group size is not constant?

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) In an intelligence test administered to 1000 students the average score was 42 and standard deviation 24. Find

- the number of students exceeding a score of 50
- the number of students lying between 30 and 54.

Or

- (b) Define Binomial distribution. State its main properties.

17. (a) Two laboratories A and B carry out independent estimates of fat content in ice-cream made by a firm. A sample is taken from each batch, halved and the separated halves sent to the two laboratories. The fat content obtained by the laboratories is recorded below:

Batch No: 1 2 3 4 5 6 7 8 9 10

Lab A: 7 8 7 3 8 6 9 4 7 8

Lab B: 9 8 8 4 7 7 9 6 6 6

(The fat contents are given in grams)

Is there a significant difference between the mean fat content obtained by the two laboratories A and B.

Or

- (b) The following table gives the number of units of production per day turned out by four different types of machines:

Types of machines

Employee	M ₁	M ₂	M ₃	M ₄
E ₁	40	36	45	30
E ₂	38	42	50	41
E ₃	36	30	48	35
E ₄	46	47	52	44

Using analysis of variance:

- (i) test the hypothesis that the mean production is the same for the four machines
- (ii) test the hypothesis that the employees do not differ with respect to mean productivity.

18. (a) 4 coins were tossed 160 items and the following results were obtained

No. of heads: 0 1 2 3 4

Observed frequencies: 17 52 54 31 6

Under the assumption that coins are balanced, find the expected frequencies of getting 0, 1, 2, 3 or 4 heads and test the goodness of fit.

Or

- (b) A company's trainees are randomly assigned to groups which are taught a certain industrial inspection procedure by three different methods: At the end of the instructing period they are tested for inspection performance quality. The following are their scores.

Method A: 80 83 79 85 90 68

Method B: 82 84 60 72 86 67 91

Method C: 93 65 77 78 88

Use the H test to determine at the 0.05 level of significance whether the three methods are equally effective.

19. (a) A group of students raises money each year by selling souvenirs outside the stadium after a cricket match between teams A and B. They can buy any of the three different types of souvenirs from a supplies. Their sales are mostly dependent on which team wins the match. A conditional pay-off table is as under:

	Type of souvenirs		
	I	II	III
	Rs.	Rs.	Rs.
Team A wins	1200	800	300
Team B wins	250	700	1000

- (i) Construct the opportunity loss table
- (ii) Which type of souvenir should the students buy it probability of team A's winning is 0.6?

Or

- (b) Explain the steps in decision tree analysis.

20. (a) The following table gives the number of errors of alignment observed at Final inspection of a certain model of bus. Prepare a C-chart and comment on the state of control.

Bus Number	Number of alignment defects	Bus Number	No. of alignment defects
1001	6	1011	8
1002	10	1012	6
1003	8	1013	10
1004	7	1014	10
1005	12	1015	6
1006	9	1016	12
1007	5	1017	3
1008	7	1018	11
1009	3	1019	2
1010	4	1020	1

Or

- (b) Explain the advantages of statistical quality control.
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