

(Pages : 3)

V – 1797

Reg. No. :

Name :

Sixth Semester B.Sc. Degree Examination, April 2025

First Degree Programme under CBCSS

Statistics

Core Course — IX

ST 1641 : DESIGN OF EXPERIMENTS AND VITAL STATISTICS

(2022 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

(Answer all questions, each question carries 1 mark)

1. What is the linear model of analysis of variance?
2. Define replication in experimental design.
3. When we use Completely Randomized Design (CRD)?
4. Explain the concept of randomization in experiments.
5. What is crude birth rate?
6. Define age-specific mortality rate.
7. What is Gross Reproduction Rate (GRR)?
8. Give the formula for standardized death rate.

P.T.O.

9. Why is blocking used in experiments?
10. What is the significance of factorial experiments?

(10 × 1 = 10 Marks)

SECTION – B

(Answer any eight questions, each question carries 2 marks)

11. What are the advantages of Randomized Block Design (RBD) over CRD?
12. Explain the concept of interaction in factorial experiments.
13. State the assumptions of Analysis of Variance (ANOVA).
14. What is the role of confounding in factorial experiments?
15. Define the concept of efficiency in experimental designs.
16. Explain the uses of life tables.
17. How is infant mortality rate calculated?
18. What are the sources of vital statistics data?
19. Give the ANOVA table for LSD.
20. What is the difference between crude and standardized mortality rates?
21. Define gross and net reproduction rates.
22. What are the different types of fertility measures?

(8 × 2 = 16 Marks)

SECTION – C

(Answer any six questions, each carries 4 marks)

23. Discuss the role of all three principles in experimental design.
24. Explain the method for estimating one missing value in an RBD.

25. Compare the efficiency of LSD with CRD.
26. Explain the assumptions and methodology of two-way ANOVA.
27. Discuss the importance of factorial experiments in industrial statistics.
28. Discuss the concept of confounding in factorial experiments.
29. Define and differentiate between total fertility rate and net reproduction rate.
30. How do stable and stationary populations differ?
31. Explain the significance and components of life tables.

(6 × 4 = 24 Marks)

SECTION – D

(Answer any **two** questions, each carries **15** marks)

32. Explain the methodology for analyzing a Randomized Block Design.
33. Discuss the Yate's method for computing factorial effect totals.
34. Explain the estimation and analysis of two missing observations in an LSD experiment.
35. Describe the construction and interpretation of a complete life table.

(2 × 15 = 30 Marks)

(Pages : 4)

V – 1798

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Sixth Semester B.Sc. Degree Examination, April 2025

First Degree Programme under CBCSS

Statistics

Core Course – X

ST 1642 : APPLIED STATISTICS

(2022 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all questions. Each carries 1 mark.

1. Paasche's index number formula uses the weights of the _____ year.
2. Define an index number.
3. Which index satisfies circular test?
4. Which is the most suitable average for the construction of index numbers, in terms of computational easiness?
5. Define a time series.
6. The straight-line trend of a time series is $20 + 2.5t$, where t is the time in years. What is the trend figure for the fourth year?
7. Define link relative.

P.T.O.

(Pages : 4)

V – 1798

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Sixth Semester B.Sc. Degree Examination, April 2025

First Degree Programme under CBCSS

Statistics

Core Course – X

ST 1642 : APPLIED STATISTICS

(2022 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all questions. Each carries 1 mark.

1. Paasche's index number formula uses the weights of the _____ year.
2. Define an index number.
3. Which index satisfies circular test?
4. Which is the most suitable average for the construction of index numbers, in terms of computational easiness?
5. Define a time series.
6. The straight-line trend of a time series is $20 + 2.5t$, where t is the time in years. What is the trend figure for the fourth year?
7. Define link relative.

P.T.O.

8. The method of fitting trend in a time series which eliminates the effects of short term movements is _____
 9. What is the full form of MOSPI?
 10. What is the main organization responsible for labour statistics in India?
- (10 × 1 = 10 Marks)**

SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. Why Fishers index is treated as an ideal one?
12. What is the difference between a price index and a quantity index?
13. Why index numbers are called economic barometers?
14. The consumer price index number for 1981 and 1982 to the base 1974 are 320 and 400 respectively. Find the consumer price index for 1981 to the base 1982.
15. Define splicing of index number.
16. Define Kelly's Index number.
17. Explain the mathematical models in time series.
18. What is meant by De-seasonalization of data?
19. What are the four phases of cyclical variations?
20. Write down the important activities of Central Statistics Organization.
21. Differentiate between the De Facto and De Jure methods of population census.
22. How does MOSPI help in monitoring the Sustainable Development Goals (SDGs)?

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. What do you understand by base Shifting? Give the formula for converting the Fixed Base Index Number to Chain Base Index Number
24. What is meant by deflating the index numbers and how can it be done?
25. Describe chain base index numbers.
26. Describe Time reversal test and Factor reversal test.
27. Explain the method of semi averages.
28. What are the advantages of ratio to moving average method over ratio to trend method?
29. Fit a trend line for the following data using three year moving average method:

Year	1991	1992	1993	1994	1995	1996	1997
Profit	20	45	22	50	60	56	90

30. Discuss the importance of livestock and poultry statistics for the Indian economy.
31. What are the major sources of fisheries statistics in India? Explain their significance.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

32. Explain any four weighted aggregate methods of price index numbers.
33. Compute Marshal-Edgeworth's index number and Fisher's ideal index number for the following data:

Items	Price		Quantity	
	2001	2003	2003	2004
I	5	6	62	71
II	7	8	43	100
III	9	12	93	65

34. Explain the four components of time series with example.

35. Annual profit (in lakhs) of a mobile phone company is:

Year	2000	2001	2002	2003	2004	2005	2006
Profit	60	72	75	65	80	85	95

Fit a straight line by method of least squares for the data and estimate the profit in 2007.

(2 × 15 = 30 Marks)

(Pages : 4)

V – 1799

Reg. No. :

Name :

Sixth Semester B.Sc. Degree Examination, April 2025

First Degree Programme under CBCSS

Statistics

Core Course – XI

**ST 1643 : OPERATIONS RESEARCH AND STATISTICAL QUALITY
CONTROL**

(2022 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. Each question carries **1** mark.

1. Define (a) Feasible solution and (b) Basic feasible solution of LPP.
2. Write the standard form of LPP.
3. What is the difference between slack variable and surplus variable?
4. Define Assignment problem.
5. What do you mean by quality?
6. Distinguish between defective and defects.
7. Define tolerance limit.
8. Write the control limits for np (or d) chart when standards are given.

P.T.O.

9. Write any two uses of OC curve.
10. Define AQL.

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. Write the procedure for the mathematical formulation of LPP.
12. Prove that the set of feasible solutions to a LPP is a convex set.
13. Define artificial variable and write its significance.
14. Prove that dual of a dual is primal by a numerical example.
15. What is the difference between balanced and unbalanced transportation problem? How we convert an unbalanced transportation problem into balanced transportation problem.
16. Write the mathematical form of assignment problem.
17. Define process control and product control.
18. Explain 3σ control limits.
19. Explain the control chart for variables.
20. What you mean consumers risk?
21. Explain LTPD.
22. What is acceptance sampling plan?

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. Solve the following LPP by graphical method

$$\text{Max } Z = 5x + 7y$$

subject to the constraints

$$x + y \leq 4$$

$$3x + 8y \leq 24$$

$$10x + 7y \leq 35$$

$$x, y \geq 0$$

24. Explain two phase simplex method.
25. Explain degeneracy in Transportation problem. How it solve?
26. Solve the following Assignment problem

	1	2	3	4
A	5	7	11	6
B	8	5	9	6
C	4	7	10	7
D	10	4	8	3

27. What are the uses of control chart?
28. Explain chance causes and assignable causes.
29. Explain ASN and ATI.
30. Write the steps for constructing control limit for mean chart.
31. Explain OC curve for double sampling plan.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

32. Use Big M method to solve the following LPP

$$\text{Minimize } Z = 2x + y$$

subject to the constraints

$$3x + y = 3$$

$$4x + 3y \geq 6$$

$$x + 2y \leq 3$$

$$x, y \geq 0$$

33. Solve the following Transportation problem

Origin	Destination			
		A	B	C
1	50	30	220	1
2	90	45	170	3
3	250	200	50	4
Demand	4	2	2	

34. Find the control limit for mean and SD for the given data and verify

Sample 1 2.3 2.2 2.4 2.3

Sample 2 2.1 2.2 2.3 2.4

Sample 3 2 2.1 2.2 2.1

Sample 4 2 2.2 2.1 2.3

Sample 5 2.5 2.1 2.4 2.3

35. (a) Differentiate single sampling plan (SSP) and double sampling plan (DSP).

(b) Explain OC curve for single sampling.

(2 × 15 = 30 Marks)

(Pages : 3)

V – 1800

Reg. No. :

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Sixth Semester B.Sc. Degree Examination, April 2025

First Degree Programme under CBCSS

Statistics

Elective Course

ST 1661.1 : BIostatistics

(2022 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Very Short Answer Type questions. Answer all questions. Each question carries 1 mark.

1. What is the primary goal of a Phase I clinical trial?
2. What does GCP stand for in clinical research?
3. Define a randomized controlled trial (RCT).
4. What is the main purpose of randomization in clinical trials?
5. Give one disadvantage of multi-center trials.
6. Define survival analysis.
7. What test is used to compare survival curves between two groups?
8. Define the concept of competing risks in survival analysis.

P.T.O.

9. What is a communicable disease?
10. Define cumulative incidence.

(10 × 1 = 10 Marks)

SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. Define a clinical trial and explain its importance in medical research.
12. What are the main objectives of clinical trials?
13. Write down the advantages of multi-center trials over single-center trials?
14. Define placebo. Why is it used in clinical trials?
15. What is unblinding?
16. What is censoring in survival analysis? Give an example.
17. Define life table.
18. How does a hazard ratio (HR) help in interpreting survival data?
19. Define epidemiology.
20. What is the difference between prevalence and incidence?
21. Name different sources of exposure in epidemiology.
22. What are the types of bias that can occur in epidemiological studies?

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. Describe the different phases of a clinical trial.
24. What are GCP and ICH guidelines? Discuss their significance in ensuring the ethical conduct of clinical trials.

25. Explain the importance of blinding and placebo control in clinical trials.
26. Describe the Kaplan-Meier estimator in survival analysis.
27. Explain the purpose of a log-rank test.
28. State the equation for the Cox proportional hazards model and explain its components.
29. Describe the scope of epidemiology.
30. Explain the difference between descriptive and analytical epidemiology.
31. What is meant by Risk and how is it different from Odds in epidemiological studies?

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries **15** marks.

32. Discuss the key features of a study protocol, including patient selection, treatment schedule, and evaluation of response.
33. Explain the different types of blinding used in clinical trials and their importance.
34. Describe the difference between parametric survival models and non-parametric models.
35. Explain the difference types of study designs (case-control, cross-sectional, cohort) and provide examples of each. Discuss the strengths and limitations of each design.

(2 × 15 = 30 Marks)