

**RESEARCH METHODOLOGY AND IPR
(CSEN 5102)**

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

**Group – A
(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) In a symmetrical distribution $Q_1=20$ and $Q_3=40$, Median of the distribution is
(a) 25 (b) 35 (c) 36 (d) 30.
- (ii) Convenience sampling is an example of
(a) probabilistic sampling (b) stratified sampling
(c) non-probabilistic sampling (d) cluster sampling.
- (iii) Analysis of variance is a statistical method of comparing the _____ of several populations.
(a) standard deviations (b) variances
(c) means (d) proportions
- (iv) What is meant by the term 'precision'?
(a) The overall quality of the data
(b) The level of detail at which data is stored
(c) The lack of bias in the data
(d) The extent to which a value approaches its true value.
- (v) The first step in reviewing the related literature is
(a) identification of the problem (b) analyzing data
(c) identification of material (d) collecting data.
- (vi) Which is not a logical Step of Scientific Method?
(a) Collecting and Analyzing data (b) Formulating Hypothesis
(c) Authority (d) Identifying the problem.
- (vii) A Hypothesis which develops while planning the research is
(a) Null Hypothesis (b) Working Hypothesis
(c) Relational Hypothesis (d) Descriptive Hypothesis.
- (viii) Aspects of the environment that might affect the participant's behaviour, e.g. noise, temperature, lighting conditions are called
(a) situational variable (b) person variable
(c) experimenter variable (d) all the above.

- (ix) Sources of evidence in pursuit of Truth are
 (a) Custom and Tradition (b) Personal Experience
 (c) Deductive Reasoning (d) All the above.
- (x) Research Plan may contain
 (a) Methodologies/Techniques to be adopted (b) A problem to study
 (c) Both (a), (b) (d) None of the Above.

Group- B

2. (a) What are the criterion of choosing research topic? Does the Research Area, it's complexity or viability matter? How? [(CO2)(Remember/LOCQ)]
 (b) Compute the principal component for the given 2D dataset.
 $D=(d1,d2)=\{(3,3),(3,5)(1,2),(5,4),(5,6),(6,5),(6,5),(8,7),(9,8)\}.$ [(CO3)(Understand/IOCQ)]
 (c) How does spreadsheet used as tool for data analysis? Give instance for applying functions, formulae and plot graphs. [(CO4)(Analyse/LOCQ)]
3 + 6 + 3 = 12
3. (a) Distinguish between research methods and research methodology? Explain with example. [(CO2)(Remember/LOCQ)]
 (b) What is the role of the existing literature in research? How do we select a topic for research? [(CO2,CO4)(Understand/LOCQ)]
 (c) Explain Type II error with example. [(CO1)(Analyse/IOCQ)]
5 + (2 + 3) + 2 = 12

Group - C

4. (a) What do you mean by 'Sample Design'? What points should be taken into consideration by a researcher in developing a sample design for this research project. [(CO4)(Understand/IOCQ)]
 (b) What do you understand by the term 'Intellectual Property Rights'? [(CO6)(Understand/LOCQ)]
 (c) With a small example instantiniate Measures of Central Tendency. [(CO1)(Analyze/IOCQ)]
5 + 5 + 2 = 12
5. (a) A population is divided into three strata so that $N_1 = 5000$, $N_2 = 2000$ and $N_3 = 3000$. Respective standard deviations are:
 $s_1 = 15$, $s_2 = 18$ and $s_3 = 5$.
 How should a sample of size $n = 84$ be allocated to the three strata, if we want optimum allocation using disproportionate sampling design? [(CO3)(Analyze/IOCQ)]
 (b) Why probability sampling is generally preferred in comparison to non-probability sampling? Explain the procedure of selecting a simple random sample. [(CO2)(Understand/LOCQ)]
 (c) Explain questionnaire as a technique of data collection. Discuss the characteristics of a good questionnaire. [(CO2)(Analyze/IOCQ)]
6 + 3 + 3 = 12

Group - D

6. (a) The annual data rate of a wireless network (in Megabytes) and the corresponding throughput (in Mbps) for the past 10 years of a company are as follows. Find the covariance and correlation coefficient between the throughput and bandwidth for the data.

Year (i)	Bandwidth (Xi)	Throughput (Yi)
1	10	20
2	12	30
3	14	37
4	16	50
5	18	56
6	20	78
7	22	89
8	24	100
9	26	120
10	28	110

[[CO3](Analyze/IOCQ)]

- (b) Write the differences between t-test and ANOVA test. What are the 3 types of t-tests?

[[CO3](Remember/LOCQ)]

(4 + 4) + (3 + 1) = 12

7. (a) With respect to the sophisticated form of analysis, differentiate informal experimental design from formal experimental design. [[CO4](Remember/LOCQ)]

- (b) With the help of a diagram represent the research processes. How does surveying the literature help? [[CO2](Remember/HOCQ)]

- (c) What are the criteria for a good research Topic (F.I.N.E.R). [[CO1](Analyze/IOCQ)]

2 + 5 + 5 = 12

Group - E

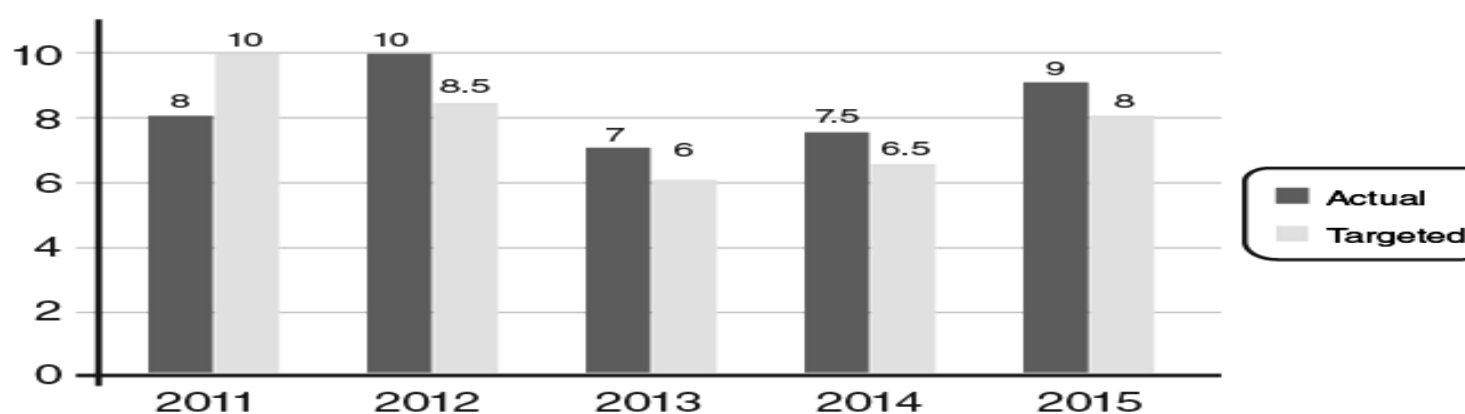
8. (a) Write the functions that we need to write in excel in order to perform the following operations:

- (i) Add the product of the corresponding elements in Column A and Column B in excel.

- (ii) Find the mean of all numbers given in Column A.

- (iii) Find the correlation between the data sets given in Columns A and B.

[[CO5](Remember/LOCQ)]



[[CO3](Understand/LOCQ)]

- (b) What would be the ratio of the minimum actual production to maximum targeted production observed from the above graph? [(CO5)(Analyse/IOCQ)]
- (c) The number of absentees in 2nd year CSE was recorded in a particular week. Represent this data on the bar graph.

Days	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Number of Absentees	130	120	145	130	150	80

- (i) On which day the maximum and minimum students were absent?
 [(CO5)(Remember/LOCQ)]
 $(2 + 2 + 2) + 2 + (2 + 2) = 12$

9. (a) Write a short note on Plagiarism. Explain Self-plagiarism and techniques to avoid them. [(CO6)(Remember/LOCQ)]
- (b) What is a patent? What are the different types of patent that you know of?
 [(CO6)(Understand/LOCQ)]
 $(4 + 3) + (3 + 2) = 12$

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	54.16	40.63	5.21

Course Outcomes (CO):

- On completion of the course the students undergoing this course are able to:
- CO1. Understand some basic concepts of research and its methodologies
 - CO2. Identify appropriate research topics
 - CO3. Select and define appropriate research problem and parameters
 - CO4. Prepare a project proposal (to undertake a project)
 - CO5. Organize and conduct research (advanced project) in a more appropriate manner
 - CO6. Write a research report and thesis.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.