

GUJARAT TECHNOLOGICAL UNIVERSITY
Ph.D. COURSE WORK EXAMINATION (REGULAR) – WINTER 2025

Subject Code: PHD2401**Date: 12/10/2025****Subject Name: Research Methodology_Engineering & Computer Science****Time: 01.30 PM – 04.30 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q 1** (a) Describe the step-by-step process of narrowing down a broad area of interest into a manageable and specific research problem. Illustrate this process with an example of "climate change". **10**
- (b) Explain how IPR directly incentivize individuals and businesses to invest time, money, and effort into research and development (R&D) and creative works. Why is this incentive crucial for both economic growth and technological progress? Explain the three main criteria for patentability under the Indian Patents Act, 1970. Discuss a recent amendment or a landmark case that has significantly impacted the patent landscape in India. **10**
- Q 2** (a) How will you manage potential researcher bias and reflexivity throughout the research process? **10**
- (b) Why research design is essential? What do you understand by a good research design? **10**
- Base diameter and height of cone are measured as 54.1 mm and 81.1 mm respectively. Calculate the uncertainty using Kline and McClintock methods in the estimation of volume of the cone.
- OR**
- (a) Discuss the qualitative research methodologies: Ethnography and Phenomenology. **10**
- (b) During an experiment, following observations are taken for temperature in K. **10**
- 302, 307, 304, 300, 301, 310, 312, 308, 307, 306
- Compute the mean temperature, standard deviation, variance and average of absolute value of deviation. Using Chauvenet's criterion, calculate the % reduction in standard deviation.
- Q 3** (a) What are the key characteristics that define scientific research? Discuss at least three characteristics and explain what each one means in the context of a research study. **05**
- (b) Explain conditional probability with suitable example. **05**
- Q 4** (a) How correlations are developed? What is the usefulness of Karl Pearson's coefficient of correlation? **05**
- (b) State the objectives of Mann Whitney U test. How it is performed? **05**
- Q 5** (a) Why is it important to report the characteristics of the interviewer or facilitator in qualitative research, as required by the COREQ guidelines? How might this impact the data collection and interpretation process? **05**
- (b) What is structured writing, and how does it benefit both the writer and the reader? **05**