

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
Ph.D. COURSE WORK EXAMINATION – REGULAR – SUMMER 2023

Subject Code: PHD2201

Date: 02/07/2023

Subject Name: Research Methodology (Engineering)

Time: 01:30 PM to 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) Explain the characteristics of high-quality research. With suitable example, also explain the various phases of research. 10
- (b) "A research scholar has to work as a judge and derive the truth and not as a pleader who is only eager to prove his case in favor of his plaintiff." Discuss the statement pointing out the objectives of research. 10
- Q.2**
- (a) Write a 4-5-page review for the research papers (at least 5 research papers must be chosen) of your field. The review may have the three parts viz. summary, critical evaluation and creative synthesise. 10
- (b) During an experiment, following observations are taken for electric voltage in volts (V). 10
230, 233, 228, 245, 236, 232, 234, 227, 231, 226
Compute the mean reading, standard deviation, variance and average of absolute value of deviation. Using Chauvenet's criterion, calculate the % reduction in standard deviation.
- OR**
- (a) Select the journal paper which is closest to your research problem and critique it. 10
- (b) 10 liter of water ($c_p = 4.187 \text{ kJ/kg K}$) is heated from 35°C to 73°C using an electric heater in 12 min. The heater is of 3 kW capacity with power supply of 230 V. Mass of water is measured with a measuring flask having accuracy of $\pm 50 \text{ ml}$. Temperatures are measured with thermocouple having accuracy of $\pm 1^\circ\text{C}$. Electric power was measured with accuracy of 10% of measured value. Calculate the uncertainty in the estimation of efficiency of electric heater using Kline and McClintock method. 10
- Q.3**
- (a) What are the common errors while writing the research objectives? Explain the process of linking research objectives to research methods. 05
- (b) What is problem formulation? What are the sources of research problem? 05
- Q.4**
- (a) With specific example, explain the meaning of qualitative validity and qualitative reliability. 05
- (b) Clearly distinguish among narrative study, phenomenological studies, grounded theory studies, ethnographic studies, and case studies. 05
- Q.5**
- (a) Why research design is essential? What do you understand by a good research design? 05
- (b) Explain the experimental planning in detail. Differential between researchable problem and problematic situation. 05
