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**PRESIDENCY UNIVERSITY**

**Bengaluru**

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| **Ph. D Course Work End Term Examinations – JAN-FEB 2025** |
| **Date:** 05 – 02- 2025 **Time:** 09:30 am – 12:30 pm |

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| **School:** SOE | **Program:** Ph. D | |
| **Course Code:** RES801 | **Course Name:** Research Methodology and Publication Ethics For Engineering | |
| **Semester**: | **Max Marks**:100 | **Weightage**:50% |

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| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** | **CO5** |
| **Marks** | **-** | **20** | **20** | **20** | **40** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Do not write anything on the question paper other than roll number.*

**Part A**

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| **Answer ALL the Questions. Each question carries 10 marks. 6Q x 10M=60Marks** | | | | |
| **1** | The procedure for formulating the research problem is of utmost importance and follows standard practices adopted by the research community at large. Discuss the sources of research problems and how to evaluate them effectively in an engineering context. | **10 Marks** | **L2** | **CO2** |
| **2** | We have learned during our discussions in the research methodology initial classes about concepts of research. Elaborate on the steps of the research process with examples from real-world engineering challenges. | **10 Marks** | **L2** | **CO2** |
| **3** | Discuss the concepts of central tendency and dispersion, and their role in interpreting engineering research data. | **10 Marks** | **L3** | **CO3** |
| **4** | Discuss the potential challenges and solutions related to research ethics and scientific conduct in the era of rapidly evolving technology and data sharing. | **10 Marks** | **L3** | **CO3** |
| **5** | What are the potential conflicts of interest in research and publication? How can researchers mitigate these conflicts to maintain research integrity? How does peer review contribute to maintaining the quality and credibility of published research? Discuss the strengths and weaknesses of the peer review process. | **10 Marks** | **L4** | **CO4** |
| **6** | Illustrate the process of defining a research problem and writing its statement by using an example related to your proposed area of research, as per one of the assignments you have carried out in this course work. | **10 Marks** | **L4** | **CO4** |

**Part B**

**Answer all the Questions. Each question carries 20 marks. 2Q x 20M=40Marks**

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| **7.** | A research project in an environmental engineering laboratory investigates the efficiency of three different water treatment methods for removing pollutants from a water sample. The researchers conduct experiments by running each treatment method on 50 different water samples and recording the pollutant concentration levels before and after treatment. The data collected for each treatment method are as follows (pollutant concentration in mg/L):  **Treatment Method 1:**  Before Treatment: [10.5, 12.1, 11.8, 10.9, 12.5, 11.2, 11.0, 10.7, 12.2, 11.5, 10.8, 11.4, 10.6, 11.3, 10.9, 11.1, 12.0, 11.6, 11.8, 10.4, 11.9, 10.6, 11.7, 12.3, 10.8]  After Treatment: [3.2, 3.6, 3.4, 3.1, 3.7, 3.3, 3.2, 3.0, 3.6, 3.4, 3.1, 3.5, 3.0, 3.4, 3.1, 3.3, 3.7, 3.5, 3.3, 3.6, 3.4, 3.2, 3.3, 3.8, 3.1]  **Treatment Method 2:**  Before Treatment: [9.5, 10.1, 10.8, 9.9, 10.5, 10.2, 9.8, 9.6, 10.2, 10.5, 9.9, 10.4, 9.6, 10.3, 10.1, 9.7, 10.0, 10.6, 10.8, 9.4, 10.9, 9.6, 10.7, 10.3, 9.8]  After Treatment: [2.8, 2.9, 2.7, 2.5, 2.6, 2.8, 2.4, 2.6, 2.9, 2.7, 2.5, 2.7, 2.4, 2.7, 2.6, 2.8, 2.5, 2.7, 2.8, 2.6, 2.9, 2.6, 2.7, 2.8, 2.5]  **Treatment Method 3:**  Before Treatment: [8.2, 8.8, 8.5, 8.9, 8.4, 8.7, 8.3, 8.6, 8.9, 8.2, 8.4, 8.7, 8.1, 8.6, 8.8, 8.5, 8.3, 8.4, 8.6, 8.2, 8.7, 8.1, 8.5, 8.9, 8.3]  After Treatment: [2.1, 2.3, 2.2, 2.0, 2.4, 2.1, 2.0, 2.2, 2.3, 2.1, 2.4, 2.2, 2.0, 2.2, 2.3, 2.1, 2.4, 2.2, 2.3, 2.1, 2.3, 2.0, 2.2, 2.4, 2.1]  Perform a statistical analysis manually to determine if there is a significant difference in the pollutant concentration levels before and after treatment for each treatment method. Use appropriate statistical tests to make a conclusion and provide relevant statistical measures to support your answer. Note: You may assume equal variances among the data sets for the statistical analysis. | **20 Marks** | **L5** | **CO5** |
| **8.** | The UNIX Laptop Retail Shop near Eco-World at Bellandur, Bengaluru, has experienced an average of 130 laptop sales per day. After the development of the nearby IT Park, the shop witnessed changes in its daily sales, as evident from the sample data as observed were 155, 150, 120, 135, 145, 155, 170, 165, 110, 160, 140, and 136. To ascertain if the sales have genuinely increased, we can employ statistical analysis with a 5% level of significance. | **20 Marks** | **L5** | **CO5** |

**\*\*\*\*\* BEST WISHES \*\*\*\*\***