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RCS-001

**Ph. D. IN COMPUTER SCIENCE
(PHDCS)**

Term-End Examination

December, 2021

RCS-001 : RESEARCH METHODOLOGY

Time : 3 Hours

Maximum Marks : 100

Weightage : 50%

Note : *Question Number 1 is compulsory. Attempt any **three** questions from the rest.*

1. (a) Discuss the term “Qualitative Research” with suitable example. How is it different from “Quantitative Research” ? Discuss the tools and techniques for both types of research, mentioned above. 8
- (b) Discuss the procedure of identification, selection and formulation of any research problem. Give suitable example in support your discussion. 8

- (c) What is Simulation ? How is simulation related to modelling ? Draw flowchart to describe the working of simulation model. Briefly discuss each component covered in flowchart drawn. 8
 - (d) Discuss the structure of a research proposal and the tentative content that needs to be written under various sections-headings. 8
 - (e) How does engineering research differ from scientific research ? Discuss the role of empirical studies in research. 8
2. (a) What is P and NP-type of problem ? How does NP-complete differ from NP-hard problem ? How do you prove that a problem is NP-complete ? What does $P \neq NP$ imply ? 10
 - (b) Formulate the following problems as optimization problems :
 - (i) TSP
 - (ii) Assignment problem
 Calculate the time complexities of the above problems in worst case. 10

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3. (a) Draw the boxplot for the following data and identify possible outlier if any.

Marks of the students out of 100 in English :

25	99	75	35	45
32	65	32	80	71
64	52	59	45	67

Find the average marks, with and without outliers. Is the data normal ? Justify. 10

- (b) Consider the following random sample data about IQ scores of five students of a school :

101, 95, 135, 88, 145

Assuming the average IQ of all the students of that city is 105, "Can you say that average IQ of the student of the school is higher than other students of the city."

- (i) Write proper H_0 and H_1 for the claim as above.
- (ii) Is the claim valid ? Justify your answer.
- Also state any assumption about the population, if any. 10

P. T. O.

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4. (a) Write Quick Sort algorithm. Calculate the best case, average case and worst case complexities of quick sort. Discuss the behaviour of quick sort algorithm, when it is applied to sorted list of data. 10
- (b) What is Literature Survey ? How is it performed ? What are the tools and techniques, available for literature survey ? Discuss, how to write the literature review of your research problem. 10
5. Write short notes on the following : $5 \times 4 = 20$
- (i) Ethical issues in computer science research
 - (ii) Divide-and-conquer technique
 - (iii) Types of research
 - (iv) Hypothesis formulation

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