

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

Term-End Examination

June, 2018

00175

RCS-001 : RESEARCH METHODOLOGY

Time : 3 hours

*Maximum Marks : 100
(Weightage : 50%)*

Note : *Question No. 1 is compulsory. Attempt any three questions from the rest.*

1. (a) What would $P = NP$ imply ? How are P, NP and NP-Complete problems related ? Give example of NP-Complete and NP-Hard problems. 8

(b) An organisation is specialized in coaching classes of medical entrance examination. They claim to have provided better training and hence better percent (%) of selection. In general, every year more than 5 lakh students sit in medical examination, with a final selection of mean percent of 5%, with a standard deviation of 4%. The organization has reported the following data of selection of their candidates,

10%, 15%, 20% 5% for 4 samples. 8

(i) Write H_0 and H_1 Hypotheses.

(ii) Is their claim valid ? Justify.

(c) Mention the ways and means of processing/finding the relevant literature on your research topic. 8

(d) What is Monte Carlo Simulation ? How does Monte Carlo Simulation address randomness of data to generate the value of π (pi) ? Explain. 8

(e) How does External sorting mechanism differ from Internal sorting mechanism ? Classify the algorithms for External and Internal sorting. Determine the best case, average case and worst case complexity of Merge Sort. 8

2. (a) Define a combinatorial optimization problem. Formulate any two combinatorial optimization problems and explain their complexity. 10

(b) The average temperature of ten weeks of Delhi and Bangalore is shown in the following table :

Delhi ($^{\circ}\text{C}$)	10	15	29	35	44	41	27	33
Bangalore ($^{\circ}\text{C}$)	31	28	30	27	33	34	28	30

Draw a side to side box plot and compare the two. 5

(c) What is h-index ? How can you calculate h-index ? Demonstrate it. Discuss the role of h-index in active research. 5

3. (a) Explain the process of reading a research paper, using three-pass mechanism. 10
- (b) What is impact factor ? How do you calculate impact factor ? Demonstrate it. Discuss the role of impact factor in active research. 5
- (c) Explain the mathematical formulation of Simulating Zero acceleration in animation. 5
4. Compare and contrast the following (give suitable diagrams/examples) : $4 \times 5 = 20$
- (a) Scientific Research and Engineering Research
- (b) Research Proposal and Synopsis
- (c) Review paper and Term paper
- (d) h-index and i-10 index
- (e) Simulation and Modeling
5. (a) Discuss various kinds of research publications. Also, discuss the "IMRAD" format used for writing the scientific research paper. 10
- (b) Write short notes on the following : $4 \times 2 \frac{1}{2} = 10$
- (i) Undecidability
- (ii) Plagiarism
- (iii) Diagonalization
- (iv) Reductions