

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

Term-End Examination

June, 2026

RCS-001 : RESEARCH METHODOLOGY

Time : 3 Hours

Maximum Marks : 100

Weightage : 50%

Note : (i) *Question No. 1 is compulsory.*

(ii) *Attempt any **three** questions from the rest.*

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1. (a) Differentiate between Scientific method of research and Engineering method of research. List the steps involved in both and draw block diagram for both methods of research. 8
 - (b) Explain 0/1 Knapsack problem. Apply your understanding of 0/1 Knapsack

problem to the situation given below :
 “Four items are given with their
 respective weights and associated
 profits as : 8

Item (i)	Weight (W_i)	Profit (P_i)
1	2	1
2	3	2
3	4	5
4	5	6

If total capacity of the bag/knapsack is 8 (W), find the optimal ways of filling the knapsack.

- (c) Write and explain all the steps involved in the research process. Support your explanation with a suitable block diagram. 8
- (d) Differentiate between modeling and simulation. What makes a problem suitable for simulation modeling and analysis ? Give an example of use of simulation. 8

- (e) What is i -10 index ? Explain the method of calculation of i -10 index with suitable example. Also discuss impact factor, how it is calculated and its importance in quality research. 8
2. (a) Explain divide and conquer approach of Matrix multiplication with suitable example. Determine the computational complexity of matrix multiplication. 10
- (b) Compare 'Term Paper', 'Review Paper' and 'Technical Paper'. Briefly discuss the structure of each that needs to be addressed. 10
3. (a) What is a decision problem ? Can every decision problem be solved in polynomial time ? Elaborate. Formulate 3CNF-SAT problem as a decision problem. 10
- (b) A sports academy claims that the result percent (%) obtained by their athletes is higher than the National average, which happens to be 55% with a standard deviation of 20%. To prove this they collected the data of four athletes which is : 68%, 79%, 90% and 62%. 10

Based on above details, perform the following :

- (i) Write H_0 and H_1 hypotheses.
 - (ii) Which test would you apply to determine that the result obtained by their athlete is higher than national average. Explain the parameters and assumptions of this test.
4. (a) Calculate best case, worst case and average case complexities of quick sort algorithm. Verify the statement “Worst case for quick sort is best case for bubble sort.” 10
- (b) Discuss the procedure of identification, selection and formulation of any research problem. Give suitable example in support of your discussion. 10
5. Write short notes on the following : $4 \times 5 = 20$
- (i) DOI and its role in active research.
 - (ii) Monographs and their role in literature review.
 - (iii) Self plagiarism and how to counter it.
 - (iv) Dynamic programming.

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