

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2024

Ph.D. I Semester (Mathematics)

COURSE CODE (CREDITS): 18PIWGE101 (3)

MAX. MARKS: 25

COURSE NAME: Research Methodologies Including Quantitative Methods and Computer Applications (Module 3)

COURSE INSTRUCTORS: SST, ALK

MAX. TIME: 2 Hours

*Note: (a) All questions are compulsory.*

*(b) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems*

Q. No.	Question	Marks
Q1	For multi-objective optimization, explain the terms Pareto front, weak and strict Pareto optimum and illustrate through a diagram for bi-objective optimization problem.	5
Q2	Explain scalarization technique and $\varepsilon$ -constraints method to solve $\min[f_1(x), f_2(x), \dots, f_n(x)]$ subject to $x \in S$ , $S = \{x \in R^m, h(x) = 0, g(x) \geq 0\}$ .	5
Q3	Describe evolutionary method and hybrid method to solve multi-objective optimization problems by providing one algorithm each with its pros and cons.	5
Q4	How is cognitive radio network (CRN) useful to solve spectrum scarcity problem in 5G and beyond?	5
Q5	How does optimization approach useful in cognitive radio network (CRN)?	5