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Diploma Programme
Programme du diplôme
Programa del Diploma

Computer science
Higher level
Paper 3

Monday 1 November 2021 (morning)

1 hour

Instructions to candidates

- Do not turn over this examination paper until instructed to do so.
- A clean copy of the **computer science case study** is required for this examination paper.
- Read the case study carefully.
- Answer all questions.
- The maximum mark for this examination paper is **[30 marks]**.

8821 – 7013

2 pages

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Answer **all** questions.

1. (a) Identify **two** characteristics of a genetic algorithm. [2]

(b) Outline what is meant by the term “elitism”. [2]

2. (a) Calculate the offspring from parents P1 and P2 using the cycle crossover (CX) method.

P1	B	A	G	C	J	D	H	E	F	I

P2	D	C	I	E	B	G	A	H	J	F

Show all your working. [4]

(b) The partially matched crossover (PMX) operator is a genetic operator that can be used with a genetic algorithm written to solve the travelling salesman problem.

PMX combines two chromosomes (parents) to produce a new chromosome (offspring).

Outline how the parental characteristics (cities) are preserved when two offspring are generated through PMX crossover. [4]

3. Compare and contrast the effectiveness of heuristic and non-heuristic algorithms for optimizing solutions. [6]

4. Fenna has decided to use roulette wheel selection and cycle crossover (CX) for her genetic algorithm. She has two other important decisions to make:

- What values to assign to the variables when they are first initialized. These variables include population size, initial population routes, and mutation rate.
- What stopping criteria to use for the genetic algorithm.

Discuss the impact that these decisions may have on the success of the genetic algorithm. [12]

References:

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