**ACTIVITY REPORTING FORM**
FOR CDC GRANTS PROGRAM
IMU Simons African Fellowship Program

*(Deadline for completion: four (4) week after the end of the research visit)*

*Please note that at least four pictures of the supported activity should be included/attached to this report.*
*(by email).*

After consideration by CDC, the intention is that this activity report and pictures will be made publicly available on the CDC website.

Name of grantee: Mohamed Abouhawwash

Home institution and country of grantee: Mansoura University, Egypt

Name of the host: Prof. Dr. Mohamed Tawhid

Name of the host institution and country: Thompson Rivers University, Kamloops, Canada

Topic of the research activity: Highly Flexible Evolutionary Multi-Objective Optimization Algorithm and Its Applications


The progress report should a brief (one page) activity report:

1. **Summary statement (1-2 sentences) of major outcome of your visit:**
   During my visit to Thompson Rivers University we proposed a new multi-criteria optimization technique to improve the diversification and intensification for Multi-Objective Sine Cosine Algorithm (MOSCA). MOSCA incorporated with Sinusoidal chaotic map which we called Chaotic Multi-Objective Sine Cosine Algorithm (CMOSCA). This approach is based on the recently proposed multi-objective sine cosine and sine cosine algorithms. Sine Cosine algorithm is meta-heuristic algorithm using a mathematical model based on sine and cosine functions. CMOSCA uses chaotic-based criteria on the optimization process to improve the convergence and diversity of solutions.

2. **Brief description of your research activities during your research visit:**
   During my visit I give a presentation in multi-objective optimization algorithms. Also I work in cooperation with another postdoctoral research associate, I attend seminars and many activities in the Mathematics Department.

3. **Students and post-doctoral fellows advised:**
   I advised and cooperate with one postdoctoral and two PhD and one master students working in different areas in multi-objective optimization.

4. **Joint activities with your host:**
   Doing regular meeting every week, discussing the suggested ideas and the results for proposed algorithms. Writing and revising the papers.

5. **Research in progress (as a result from the visit):**
   i) Chaotic Multi-Objective Multi-Verse Optimization algorithm
   ii) Improving Multi-Objective Sine Cosine Algorithm Using Chaos Theory

6. **Papers published or in preprint form as a result from the research visit:**
   a) Chaotic Multi-Objective Multi-Verse Optimization algorithm (in preprint)
   b) Improving Multi-Objective Sine Cosine Algorithm Using Chaos Theory (in preprint)

7. **Planned future activities as a result of your research visit:**
   We arrange a weekly meeting to continue work in proposing a new directions and algorithms for multi-objective optimization algorithms and we will work with another groups, also we will supervised PhD and master students together in Mansoura University and Thomson Rivers University.

With my signature I agree that my Activity Report and pictures can be published on the CDC website.

Date: 12/31/2018

Signature Grantee: Mohamed Abouhawwash