

Appendix A

Optimization algorithms parameters

**Table -A.1** DGSA and GA controlling parameters

DGSA	Value	GA	Value
Number of Agents	50	Population size	50
Initial Gravitation Constant ( $G_0$ )	100	Mutation probability	0.15
Specified constant ( $\alpha$ )	20	Crossover probability	0.8
R(Distance between two particles) Power	1	Length of chromosomes	8 bits
Maximum iterations (Iter)	100	Maximum iterations (Iter)	100

**Table -A2.** IEEE 123 node feeder test system loading type classification with ZIP coefficients

Loading Type	ZIP Coefficients [16]		Node Number
<b>Residential</b>	$Z_p = 0.85$ $I_p = -1.12$ $P_p = 1.27$	$Z_q = 10.96$ $I_q = -18.73$ $P_q = 8.77$	2,4,5,6,7,10,12,16,35,37,38,39,41,42,43,45,46,47,48,49,50,51,52,53,55,56,58,59,60,65,94,95,96,102,103,104,106,107,109,111,112,113,114
<b>Large Commercial</b>	$Z_p = 0.47$ $I_p = -0.53$ $P_p = 1.06$	$Z_q = 5.30$ $I_q = -8.73$ $P_q = 4.43$	62,63,64, 66,80,82,85
<b>Small Commercial</b>	$Z_p = 0.43,$ $I_p = -0.06,$ $P_p = 0.63$	$Z_q = 4.06,$ $I_q = -6.65,$ $P_q = 3.59$	1,9,11,17,19,20,22,24,28,29,30,31,32,33,34,68,69,70,71,73,74,75,83,84,87,88,90,92,98,99,100
<b>Industrial</b>	$Z_p = 0, I_p = 0,$ $P_p = 1$	$Z_q = 0, I_q = 0,$ $P_q = 1$	76,77,79,86

## Appendix B

### *DMOPSO controlling parameters*

**Table -B.1** DMOPSO controlling parameters

Population Size	100
Repository Size	80
Inertia Weight (w)	1
Mutation rate	0.1
Inertia Weight Damping Rate (wdamp)	0.99
Maximum iterations (Iter)	150
Personal and Global Learning Coefficient (c1, c2)	2, 1.8

### *VVC droop point parameters*

**Table B.2** VVC droop point parameters

Point P1 voltage = 0.94 p.u.,	Point P2 voltage = 0.95 p.u.
Point P3 voltage = 1.05 p.u.,	Point P4 voltage = 1.06 p.u.
Dead Band (DB) range = Between point P2 and P3 (0.95 p.u. -1.05 p.u.), 0.1 p.u.	

## Appendix C

### *DPSO optimization parameters*

**Table -C.1** DPSO controlling parameters

Population Size	100
inertia weight damping rate	0.99
Inertia Weight (w)	1
Mutation rate	0.1
Inertia Weight Damping Rate (wdamp)	0.99
Maximum iterations (Iter)	50
Personal and Global Learning Coefficient (c1, c2)	2, 1.8

### *PV/EV smart inverter droop parameters*

**Table C.2** PV/EV droop point parameters

<b>PV Droop Parameters</b>	<b>EV Droop Parameters</b>
$V^1_{P1} = 0.948, V^2_{P2} = 0.951$	$V^1_{P1} = 0.946, V^2_{P2} = 0.95$
$V^3_{P3} = 1.05, V^4_{P4} = 1.06$	$V^3_{P3} = 1.05, V^4_{P4} = 1.06$

### *PV Inverter droop point parameters*

**Table C.3** Predefined droop point parameters

Point P1 voltage = 0.94 p.u.,	Point P2 voltage = 0.97 p.u.,
Point P3 voltage = 1.02 p.u.,	Point P4 voltage= 1.05 p.u.,
Dead band range (between point P2 and P3) = 0.97–1.02 p.u.	

## AWARD

- Awarded Prestigious *POSOCO Power System Award (PPSA-2020)* under *Doctoral Category* for his research work, organized by *Power System Operation Cooperation (POSOCO) Ltd.* India in association with Fundamental for Innovation Technology Transfer (FITT), Indian Institute of Technology, Delhi.
- Awarded Prestigious *Bhaskara Advance Solar Energy (BASE) Fellowship-2018* award supported by the Department of Science and Technology, Govt. of India, and the Indo-U.S. Science and Technology Forum (IUSSTF) for six-month Internship at *National Renewable Energy Laboratory*, (NREL) Golden, CO, USA.