

**LIST OF TABLES**

<b>Table</b>		<b>Page</b>
3.1	Non inverting four switch buck boost converter parameters	36
4.1	NFSBB Converter Specification	43
4.2	Switching State of proposed inverter	50
4.3	Switching Table of Space Vector Modulation	51
4.4	Motor Specification	53
5.1	Simulation parameters	66
6.1	Simulation parameters BLDC Motor & SLQZSI Circuit	79
7.1	PV Specifications	88
7.2	BLDC Motor Specifications	90
7.3	Hardware parameters	93
8.1	Comparison of various parameter using different control method	98
8.2	Comparison of various parameter of BLDC motor using IFOC and Hardware	99

## LIST OF FIGURES

<b>Figure</b>	<b>Page</b>
3.1 Overall structure of Autonomous PV module	29
3.2 Equivalent circuit diagram of autonomous photovoltaic module	30
3.3 Pulse Pattern of NFSBB converter	31
3.4 Flow chart of P & O algorithm applied for NFSBB converter	32
3.5 Switching pattern of three phase inverter fed BLDC drive	33
3.6 Block Diagram Sensor less control using hysteresis comparator	34
3.7 Simulation implementation circuit of Autonomous PV module for sensor less control of BLDC motor	36
3.8 DC Link response of three phase inverter driven BLDC motor	37
3.9 Stator current response of BLDC motor	38
3.10 FFT Analysis on Stator Current using hysteresis comparator based Sine PWM	38
3.11 Speed response of BLDC motor in RPM	39
3.12 Electromagnetic torque responses	39
4.1 Block Diagram of Phase Current Infusion based Sensor less BLDC motor control	42
4.2 Circuit Diagram of Non inverting four switch buck boost converter	43
4.3 Incremental conductance MPPT curve on PV system	44
4.4 Flow chart of proposed incremental conductance algorithm	46
4.5 (a) V-I Characteristic of Constant Irradiance	47
(b) P-V Characteristic of Constant Irradiance	47
4.6 Proposed sensor less control method using phase current infusion	48
4.7 Space vector hexagon showing six sectors	51
4.8 Simulation implementation of advanced solar power generation system	53
4.9 Dc-link voltage using INC-CON MPPT and NFSBB converter	54

<b>Figure</b>	<b>Page</b>
4.10 R phase stator current performance of BLDC motor	54
4.11 FFT Analysis on Stator Current using Phase Current Infusion technique based Space Vector PWM	55
4.12 Speed response of BLDC motor in RPM	55
4.13 Electromagnetic torque responses	56
5.1 Circuit Diagram of Switched Inductor Z –Source Inverter	58
5.2 Shoot through State of SLQZSI	59
5.3 Non Shoot through State of SLQZSI	60
5.4 Control circuit for sensor less vector control of BLDC motor using maximum boost PWM technique	61
5.5 PWM generation using maximum boost technique carrier signal, reference voltage and current signal ( $V_{carrier}, V_{ref}, i_{abc}$ )	62
5.6 Block Diagram of self-tuning fuzzy PID controller	63
5.7 Membership functions of I/O fuzzy and control rules assignment	64
5.8 Surface diagram of Fuzzy	65
5.9 Overall simulation implementation of proposed circuit and control system	67
5.10 Dc-link voltage response of SLQZS inverter	68
5.11 Response of Stator current	68
5.12 FFT Analysis on Stator Current using Simple Maximum Boost PWM	69
5.13 Response of BLDC motor Speed	69
5.14 Response of BLDC motors Electromagnetic Torque	70
6.1 Proposed Sensor less control of BLDC motor with back EMF observer and simplified IFOC technique	74
6.2 Circuit diagram of switched inductor quasi z-source inverter	75
6.3 Flow Chart of back EMF observer based Speed Estimation Method	77
6.4 Simulink Design of Hysteresis current controller	78

<b>Figure</b>	<b>Page</b>	
6.5	MATLAB Implementation of proposed sensor less BLDC motor drive	80
6.6	DC Link voltage waveform of SLQZS inverter	81
6.7	R-phase voltage of SLQZS inverter	81
6.8	BLDC motors Stator current waveform for varying speed reference	82
6.9	FFT Analysis on Stator Current using IFOC Technique	82
6.10	Speed Response of BLDC motor	83
6.11	Electro-magnetic Torque waveform	83
6.12	Speed response from speed measurement and estimated speed for step change of speed reference at t=0.8s	84
6.14	BLDC motors Electromagnetic torque waveform for varying speed reference	84
7.1	Block Diagram of Hardware implementation	86
7.2	PV Panel	88
7.3	BLDC MOTOR	89
7.4	Pin Diagram of DSPIC33FJ32MC202	91
7.5	Schematic of TLP 250 as Driver unit	92
7.6	Experimental setup of proposed drive	93
7.7	DC link voltage of Inverter	94
7.8	R phase voltage of inverter	94
7.9	Experimental Harmonics on Stator Current	95
7.10	Experimental speed response in RPM	95
8.1	Comparison of using Voltage and Speed IFOC and Experimental result	99
8.2	Comparison of Harmonics of stator current and torque using IFOC and Experimental results	100