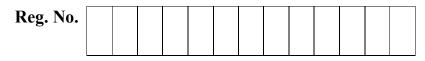
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# **B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2023**

### Seventh Semester

## EE18704 – WIND AND SOLAR ENERGY SYSTEMS

Electrical and Electronics Engineering

#### (Regulation 2018)

#### **TIME: 3 HOURS**

#### MAX. MARKS: 100

CO

RBT

- CO 1 Realize the need and structure of wind and solar energy based generation
- CO 2 Model fixed and variable speed wind energy conversion systems
- **CO 3** Design and apply solar PV system for electrical applications
- CO 4 Analyze the standalone and grid connected operation of solar PV and wind energy conversion systems

### **PART-** A (10 x 2 = 20 Marks)

(Answer all Questions)

					LEVEL
1.	Interpr	et the implementation of an aerofoil design in wind turbine blades.		1	2
2.	Identify	the problems associated with tapping solar energy.		1	2
3.	What is	s constant speed constant frequency systems in WECS?		2	1
4.	Why ar	e induction generators preferred over DC generators in WECS?		2	2
5.	Compa	re fixed and variable speed wind energy conversion systems.		2	2
6.	Expres	s the steady state equation of PMSG.		2	2
7.	How m	aximum power point tracking is employed in solar PV systems?		3	2
8.	What a	re the factors to be considered for the selection of inverter for solar energy		3	1
	convers	sion system?			
9.	List the	various impacts of high penetration of wind power in to power grid.		4	2
10.	What is meant by fault ride through capability?			4	1
		<b>PART- B (5 x 14 = 70 Marks)</b>			
			Marks	CO	RBT LEVEL
<b>11. (a)</b> Analyse the various components of wind energy conversion systems.		(14)	1	4	
		(OR)			
(	(b) (i)	Differentiate between horizontal and vertical axis wind turbines.	(7)	1	4
	(ii)	Identify the various impacts of wind and solar energy generation on	(7)	1	4
		the environment and investigate the effects of it.			

12. (a)	Derive the induction generator's steady state model and evaluate the	Q. Coo (14)	le:23 2	8358 4		
	performance characteristics.					
(OR)						
(b)	(i) Illustrate and explain the power Vs wind speed characteristics for	(7)	2	4		
	constant speed generation scheme.					
	(ii) Describe the drive train model using the appropriate equations.	(7)	2	4		
13. (a)	Describe different modes of operation of DFIG and derive the steady state model for DFIG from basics.	(14)	2	4		
( <b>b</b> )	(OR) Analyse the basic structure, model and operation of PMSG based WECS.	(14)	ſ	4		
(b)	Analyse the basic structure, model and operation of PMSG based wees.	(14)	2	4		
14. (a)	Discuss the various aspects of selection of inverter, design of batteries and	(14)	3	3		
	arrays for solar PV energy conversion system.					
	(OR)					
(b)	Using the solar PV cell characteristics, demonstrate the maximum power	(14)	3	3		
	point tracking and list various MPPT algorithms.					
15. (a)	Demonstrate the grid integrated operation of solar PV systems with a neat sketch.	(14)	4	3		
	(OR)					
(b)	Depict and discuss the operation of standalone fixed and variable speed WECS.	(14)	4	3		
	<b>PART-</b> C (1 x 10 = 10 Marks)					
	(Q.No.16 is compulsory)	Marks	со	RBT		
		11200210	00	LEVEL		
16.	The following electrical appliances are used in a residential house:	(10)	3	5		
	• Three 40 Watts fluorescent lamp used for 6 hours per day.					
	• Two 60 Watts fan used for 4 hours per day.					
	• One 100 Watts refrigerator that runs 24 hours per day with					
	compressor run 12 hours and off 12 hours.					
	The system will be powered by 12 V DC, 110 Wp PV module with panel					
	generation factor of 3.4. Design a solar PV array suitable for this house					
	along with the battery sizing.					
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