Q. Code: 804967

Reg. No. | | | | | | | | | | | | | | |

B.E./ B.TECH. DEGREE EXAMINATIONS, MAY 2024

Seventh Semester

EE18704 – WIND AND SOLAR ENERGY SYSTEMS

(Electrical and Electronics Engineering)

(Regulations 2018 / 2018A)

TIME: 3 HOURS **MAX. MARKS: 100**

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

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Classify the horizontal axis wind turbines.	**1**	**2**
2.	Why the tip speed ratio is maintained constant in wind turbine generators?	**1**	**2**
3.	Draw the power angle curve of synchronous generator.	**2**	**2**
4.	Interpret the brake system employed during gust wind in WECS.	**2**	**2**
5.	Distinguish between fixed and variable speed wind energy conversion systems.	**2**	**2**
6.	Mention the advantages and disadvantages of PMSG.	**2**	**2**
7.	Define fill factor of solar PV cell.	**3**	**2**
8.	Mention the applications of solar PV systems.	**3**	**2**
9.	Implicit the importance of soft starters.	**4**	**2**
10.	Write a short note on LVRT.	**4**	**1**

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Examine the various schemes of wind energy conversion system.	**(14)**	**1**	**4**
	(OR)			
(b)	Analyse the review of reference theory fundamentals with relevant transformation technique.	**(14)**	**1**	**4**
12. (a)	Derive the steady state model of induction generator and discuss its performance characteristics.	**(14)**	**2**	**4**
	(OR)			

(b)	Explain the state space based induction generator model and derive its state equations with RLC load.	**(14)**	**2**	**4**

13. (a)	Analyze the transient model of DFIG and derive its relevant expression from its stator side and rotor side by obtain its d-q equivalent circuit. .	**(14)**	**2**	**4**
	(OR)				
(b)	Analyze the basic structure, model and operation of PMSG based WECS.	**(14)**	**2**	**4**

14. (a)	Explain in detail about the various methods of MPPT algorithms for PV System.	**(14)**	**3**	**3**
	(OR)				
(b)	Describe the various aspects of selection of inverter, design of batteries and arrays for solar PV energy generation system.	**(14)**	**3**	**3**

15. (a)	Illustrate and discuss the operation of stand-alone fixed and variable speed WECS.	**(14)**	**4**	**3**
	(OR)				
(b)	Explain the operation of different types of grid integrated WECS with neat block diagram.	**(14)**	**4**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	The following electrical appliances are utilized in a residential house: • Five 100 watts fluorescent lamp used for 6 hours per day. • Two 40 watts fan used for 8 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 a 12 V DC, 120 Wp PV module with panel generation factor of 4.2. Design a solar PV array suitable for this house along with the battery sizing.	**(10)**	**3**	**5**

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