Q. Code:357473

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

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

Second Semester

PD22014 – POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS

(Regulation 2022)

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

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Analyze the impacts of renewable energy technologies on the environment and demonstrate them to harness electrical power.	**4**
CO 2	Select a suitable Electrical machine for Wind Energy Conversion Systems.	**4**
CO 3	Design the power converters such as AC-DC, DC-DC, and AC-AC converters for Solar energy systems.	**4**
CO 4	Design the power converters such as AC-DC, DC-DC, and AC-AC converters for Wind energy systems.	**4**
CO 5	Interpret the stand-alone, grid-connected, and hybrid renewable energy systems with MPPT.	**4**

PART- A (20 x 2 = 40 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	List out the major factors influencing the amount of GHG emissions.	**1**	**2**
2.	Highlight the significance of hydrogen energy.	**1**	**2**
3.	How biomass conversion takes place?	**1**	**2**
4.	Distinguish between spring and neap tides.	**1**	**2**
5.	Why are induction generators preferred over DC generators in WECS?	**2**	**2**
6.	Justify the need of reference frame theory.	**2**	**3**
7.	Draw slip-torque characteristics of induction generator.	**2**	**3**
8.	Compare and interpret PMSG and DFIG.	**2**	**2**
9.	Identify the issues to be addressed while integrating the solar PV systems with grid.	**3**	**2**
10.	List the factors to be considered for the selection of inverter and batteries for solar energy conversion.	**3**	**2**
11.	Draw the block diagram of solar photovoltaic system.	**3**	**3**
12.	Mention some of the issues in stand-alone PV systems.	**3**	**2**
13.	Differentiate between fixed and variable speed WECS.	**4**	**2**
14.	What is Grid-Interactive Inverters?	**4**	**2**
15.	Highlight the impact of high penetration of wind power in to power grid.	**4**	**2**
16.	List the limitations in the operation of matrix converter.	**4**	**2**
17.	How is electrical maximum power tracking different from a mechanical sun-tracking of a PV module?	**5**	**2**
18.	Justify the need for hybrid systems.	**5**	**3**
19.	Draw the schematic diagram of PV-Diesel hybrid system.	**5**	**3**
20.	What is the necessity of Maximum power point tracking in PV system?	**5**	**2**

PART- B (5 x 10 = 50 Marks)

		Marks	CO	RBT LEVEL
21.(a)	Enumerate the operating principles and characteristics of Fuell cell.	**(10)**	**1**	**4**
	(OR)			
(b)	Analyze how solar and wind energy sources plays a significant role of electric power generation.	**(10)**	**1**	**4**
22.(a)	Draw the schematic of Double Fed Induction Generator and discuss its construction and principle of operation in detail.	**(10)**	**2**	**4**
	(OR)			
(b)	Analyze the SCIG based wind energy conversion system in detail. Discuss its advantages and operating issues.	**(10)**	**2**	**4**
23.(a)	Consider a buck boost converter of input voltage E_{dc} =14V. The duty cycle α = 0.6 and the switching frequency is 25 kHZ. The inductance L=180 μH and the filter capacitance C=220 μF. The average load current I_o =1.5A. Compute the average output voltage and peak current of the device.	**(10)**	**3**	**4**
	(OR)			
(b)	Analyze the impacts of grid integrated solar PV Systems.	**(10)**	**3**	**4**
24.(a)	Draw and discuss the operation of grid integrated PMSG system with a neat schematic. Also discuss its limitation with regard to implementation and operation.	**(10)**	**4**	**4**
	(OR)			
(b)	Examine the working of AC-DC-AC converter with necessary circuit and wave form for wind energy conversion.	**(10)**	**4**	**4**
25.(a)	Draw the block diagram of the Hybrid renewable energy system which integrates wind energy system and solar PV system and explain the operation in detail. Also explain the issues and challenges in the operation of Hybrid systems.	**(10)**	**5**	**4**
	(OR)			
(b)	Enlighten the need and advantages of hybrid renewable energy systems. Also explain the operation of Biomass - Diesel system with neat diagrams in detail.	**(10)**	**5**	**4**

PART- C (1 x 10 = 10 Marks)

(Q.No.26 is compulsory)

		Marks	CO	RBT LEVEL
26.	Design a 1 KWp PV array suitable for domestic applications along with the battery sizing.	**(10)**	**3**	**5**

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