SRM VALLIAMMAI ENGINEERING COLLEGE

(An autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

Academic Year 2025-2026 ODD

1905712-RENEWABLE ENERGY SYSTEMS

Prepared By

Mr. S. Venkatesh

Assistant Professor - (O.G)

SRM VALLIAMMAI ENGINEERING COLLEGE

(An Autonomous Institution)

SRM Nagar, Kattankulathur – 603 203

Department of Electrical and Electronics Engineering

QUESTION BANK

SUBJECT: 1905712 - RENEWABLE ENERGY SYSTEMS

SEM / YEAR: VII / IV - Academic Year 2025 – 2026 ODD

UNIT I –INTRODUCTION

SYLLABUS: Environmental aspects o f electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

PART – A

Q.No	Questions	BT Level	Competence	Course Outcome
1.	Give any two environmental aspects of electric energy conversion.	BTL-2	Understanding	CO 1
2.	Discuss about GHG emission? List the factors influencing the amount of GHG emissions.	BTL-1	Remembering	CO 1
3.	List various renewable energy resources.	BTL-1	Remembering	CO 1
4.	Explain the principle of power generation using tides.	BTL-3	Applying	CO 1
5.	Discuss how to use hydrogen energy to generate electric power.	BTL-2	Understanding	CO 1
6.	Mention some types of fuel used in biomass plant.	BTL-1	Remembering	CO 1
7.	Summarize the factors influencing solar power extraction.	BTL-5	Evaluating	CO 1
8.	Identify the limitation of solar power.	BTL-1	Remembering	CO 1
9.	Explain about NOCT and STC of a solar cell.	BTL-4	Analyzing	CO 1
10.	Discuss about fuel cell and mention its specification.	BTL-2	Understanding	CO 1
11.	Justify how fuel cell becomes renewable energy source.	BTL-3	Applying	CO 1

12.	Classify the types of fuel cell.	BTL-3	Applying	CO 1
13.	Write the principle of operation of wind turbine.	BTL-4	Analyzing	CO 1
14.	Explain how to assess the wind energy pattern for a particular Location.	BTL-4	Analyzing	CO 1
15.	List the wind turbine used for domestic application.	BTL-1	Remembering	CO 1
16.	Formulate the current equation of solar array.	BTL-6	Creating	CO 1
17.	Define specific rated capacity of wind turbine.	BTL-6	Creating	CO 1
18.	List the factors involved in biomass conversion.	BTL-1	Remembering	CO 1
19.	State the merits of renewable energy source.	BTL-2	Understanding	CO 1
20.	Mention some of the organic materials used in bio-mass plant.	BTL-5	Evaluating	CO 1
21.	Discuss about shadow flickering.	BTL-2	Understanding	CO 1
22.	Write about NER.	BTL-3	Applying	CO 1
23.	Mention about pollutants during geothermal energy conversion.	BTL-1	Remembering	CO 1
24.	Write in detail about land usage in geo thermal energy.	BTL-4	Analyzing	CO 1
	PART –B			
1.	(i). Discuss the impact of renewable energy generation on environment. (8) (ii). What is Hydrogen energy? Explain the operation of hydrogen energy system with schematic diagram. (5)	BTL-2 BTL-2	Understanding Understanding	CO 1 CO 1
2.	Discuss the qualitative study of different renewable energy Resources. (13)	BTL-2	Understanding	CO 1
3.	Describe various biomass energy conversion techniques. (13)	BTL-1	Remembering	CO 1
4.	How does environment get affected by the use of the renewable Energy? (13)	BTL-2	Understanding	CO 1
5.	Explain the working principle of various types of concentrating solar collectors with neat sketch. (13)	BTL-4	Analyzing	CO 1
6.	Describe the principle of generation of Bio gas and mention the factors affecting its generation. (13)	BTL-1	Remembering	CO 1

7.	Describe the operation and control strategy of solar power conversion systems. (13)	BTL-1	Remembering	CO 1
8.	Illustrate the design and principle of operation of general Fuel cell and Fossil Fuel cell. (13)	BTL-6	Creating	CO 1
9.	(i). Show the different types of ocean thermal energy conversion power plants? (8) (ii). Illustrate in detail the Anderson OTEC cycle. (5)	BTL-3 BTL-3	Applying Applying	CO 1
10.	List out the available renewable energy sources. Explain how solar and wind energy sources plays significant role of electric power generation. (13)	BTL-5	Evaluating	CO 1
11.	Explain the following with neat schematic. (i)Biomass energysystem. (8) (ii)Energy from the Ocean. (5)	BTL-4	Analyzing	CO 1
12.	Explain the construction, working and different characteristics of solar array in detail. (13)	BTL-4	Analyzing	CO 1
13.	Discuss the impact of following renewable energy generation on environment. (i)Ocean energy. (7) (ii)Wind energy system. (6)	BTL-3	Applying	CO 1
14.	What is a fuel cell? Mention the different types of fuel cell and explain any three of them in detail with neat diagrams. (13)	BTL-1	Remembering	CO 1
15.	Describe in detail about geothermal energy systems and its impacts on environment. (13)	BTL-1	Remembering	CO 1
16.	Explain about environmental impacts of tidal and hydrogen-based energy systems. (13)	BTL-4	Analyzing	CO 1
17.	Illustrate on hybrid energy systems. (13)	BTL-3	Applying	CO 1
	PART C			
1.	Enumerate the availability of renewable energy sources in India. (15)	BTL-5	Evaluating	CO 1
2.	Explain the power generation cycle of a Tidal power. (15)	BTL-4	Analyzing	CO 1

3.	Discuss the influence of different renewable energy sources with special reference to the global warming and climate change context. (15)	BTL-6	Creating	CO 1
4.	Analyze the difficulties encountered in commercializing the renewable energy sources. (15)	BTL-4	Analyzing	CO 1
5.	Compare the land facility used by renewable energy and non-renewable for per unit generation of energy. (15)	BTL-3	Applying	CO 1

UNIT II - ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION				
SYLLABUS: Reference theory fundamentals-principle of operation and analysis: IG, PMSG.				
PART – A				
Q. No	**Questions**	**BT Level**	**Competence**	**Course Outcome**
1.	Define reference theory and write its significance.	BTL-1	Remembering	CO 2
2.	Show the merits of squirrel cage induction generators for wind energy conversion.	BTL-3	Applying	CO 2
3.	Define Clarke transformation.	BTL-1	Remembering	CO 2
4.	Define Park transformation.	BTL-1	Remembering	CO 2
5.	Name any four types of generators used in wind energy conversion systems.	BTL-2	Understanding	CO 2
6.	Why are induction generators preferred over dc generators in WECS, Justify?	BTL-5	Evaluating	CO 2
7.	Give the advantages of IG used in WECS.	BTL-2	Understanding	CO 2
8.	Label the slip-torque characteristics of PMSG.	BTL-1	Remembering	CO 2
9.	Illustrate the principle of SCIG.	BTL-3	Applying	CO 2
10.	Show the merits of DFIG for WECS.	BTL-3	Applying	CO 2
11.	Express the steady state equation of a PMSG.	BTL-2	Understanding	CO 2
12.	Explain briefly, the rotor construction of DFIG.	BTL-4	Analyzing	CO 2
13.	Compose the characteristics of DFIG.	BTL-6	Creating	CO 2
14.	Differentiate between SCIG and DFIG.	BTL-4	Analyzing	CO 2
15.	Draw the Speed-torque curve of induction generator.	BTL-1	Remembering	CO 2
16.	Draw the angular relationship of abc and dq winding in	BTL-2	Understanding	CO 2

	an induction generator.			
17.	What are the advantages of permanent magnet synchronous generator?	BTL-4	Analyzing	CO 2
18.	What is doubly fed induction generator?	BTL-5	Evaluating	CO 2
19.	List the merits of synchronous generator-based wind energy conversion system.	BTL-1	Remembering	CO 2
20.	Draw the equivalent circuit model of a PMSG.	BTL-6	Creating	CO 2
21.	Illustrate on slip importance in induction generator.	BTL-3	Applying	CO 2
22.	Define sub-synchronous mode in IG.	BTL-1	Remembering	CO 2
23.	Give out torque equation of induction generator.	BTL-2	Understanding	CO 2
24.	Examine about space vector modulation in IG.	BTL-4	Analyzing	CO 2
	PART –B			
1.	Describe the following (i). Clarks Transformation. (7) (ii). Parks Transformation. (6)	BTL-1	Remembering	CO 2
2.	(i). Explain construction, principle of working and characteristics of IG with neat sketches. (8) (ii). Analyze the merits and demerits of the above. (5)	BTL-4 BTL-4	Analyzing Analyzing	CO 2
3.	(i). Explain with a neat diagram the operation of an induction generator. (8) (ii). Compose the merits and demerits of mains excited and capacitor excited induction generator. (5)	BTL-4 BTL-6	Analyzing Creating	CO 2
4.	Draw the equivalent circuit and show the steady state analysis of Permanent magnet Synchronous Generator (PMSG). Explain the merits and demerits of PMSG for wind energy conversion systems. (13)	BTL-2	Understanding	CO 2
5.	Explain the analysis of Induction Generator used for Wind Energy Conversion System. (13)	BTL-4	Analyzing	CO 2
6.	Discuss the working and operation of PMSG with neat diagram. (13)	BTL-2	Understanding	CO 2
7.	Illustrate the working and principle of grid connected	BTL-5	Evaluating	CO 2

	PMSG in wind power plant. (13)			
8.	Draw and describe the characteristics of DFIG. (13)	BTL-2	Understanding	CO 2
9.	(i). Explain the operating principle of squirrel cage Induction Generator coupled with wind turbine. (7) (ii). Show the relative merits of wind energy conversion system with Permanent Magnet Synchronous Generator (PMSG) and IG. (6)	BTL-3 BTL-3	Applying Applying	CO 2 CO 2
10.	(i). Discuss the principle and construction of SCIG. (8) (ii) Discuss the operation of SCIG in details with proper analysis. (5)	BTL-2 BTL-2	Understanding Understanding	CO 2
11.	Discuss about DFIG based energy conversion system. (13)	BTL-2	Understanding	CO 2
12.	Describe the principle of operation of DFIG with neat diagram used for renewable energy conversion. (13)	BTL-1	Remembering	CO 2
13.	(i). Compose briefly construction, principle of working of SCIG with neat sketches. (7) (ii). Draw and explain the characteristics of SCIG. (6)	BTL-6 BTL-4	Creating Analyzing	CO 2
14.	Explain the construction and working of PMSG and analyze the system using steady state equation with phasor diagram. (13)	BTL-1	Remembering	CO 2
15.	Discuss speed versus torque and torque versus speed characteristics of induction generator. (13)	BTL-2	Understanding	CO 2
16.	Explain in detail about modelling of induction generator. (13)	BTL-3	Applying	CO 2
17.	Draw and describe about equivalent circuit of induction generator. (13)	BTL-2	Understanding	CO 2
	PART C			
1.	Demonstrate the self-excited induction generator with external capacitor. (15)	BTL-6	Creating	CO 2

2.	Design the modeling of permanent magnet synchronous generator. (15)	BTL-6	Creating	CO 2
3.	Illustrate the Dynamic d-q equivalent circuit of DFIG. (15)	BTL-5	Evaluating	CO 2
4.	Compose the equivalent electrical circuit of induction machine for performance calculations. (15)	BTL-4	Evaluating	CO 2
5.	Sketch scalar control scheme of induction generator. (15)	BTL-5	Evaluating	CO 2

UNIT III - POWER CONVERTERS

SYLLABUS: Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing Wind: Three phase AC voltage controllers.

PART – A

Q.No	Questions	BT Level	Competence	Course Outcome
1.	Label the block diagram of solar photovoltaic system.	BTL-1	Remembering	CO 3
2.	Explain inversion mode of operation of line commutated inverter.	BTL-4	Analyzing	CO 3
3.	List the advantages of dc link inverters.	BTL-1	Remembering	CO 3
4.	Generalize the significance of buck boost converter.	BTL-6	Creating	CO 3
5.	Draw the I-V and P-V characteristics of solar cell.	BTL-2	Understanding	CO 3
6.	What is the function of boost converter in solar photovoltaic system?	BTL-2	Understanding	CO 3
7.	Explain the various aspects of battery sizing	BTL-4	Analyzing	CO 3
8.	Define array sizing.	BTL-1	Remembering	CO 3
9.	Identify the factors to be considered for the selection of inverter and batteries for solar energy conversion.	BTL-1	Remembering	CO 3
10.	Identify limitations of AC voltage controller.	BTL-1	Remembering	CO 3
11.	Mention the factors considered in the selection of inverter and battery sizing.	BTL-3	Applying	CO 3
12.	Explain grid interactive inverter.	BTL-5	Evaluating	CO 3
13.	Explain matrix converters. Compose its merits.	BTL-6	Creating	CO 3

14.	Show the limitations in the operation of matrix converter.	BTL-3	Applying	CO 3
15.	Explain where are matrix converters can be used.	BTL-4	Analyzing	CO 3
16.	What is the need for DC-DC converter in solar power system?	BTL-2	Understanding	CO 3
17.	Give the schematic diagram of boost converter.	BTL-3	Applying	CO 3
18.	Mention about SOC and its methods.	BTL-4	Analyzing	CO 3
19.	Specify about power conversion ratio.	BTL-2	Understanding	CO 3
20.	What is the function of boost converter in solar photovoltaic system?	BTL-1	Remembering	CO 3
21.	Define stand-alone systems.	BTL-1	Remembering	CO 3
22.	Illustrate on line commutated converter.	BTL-3	Applying	CO 3
23.	Explain continuous conduction mode in converters.	BTL-4	Analyzing	CO 3
24.	Discuss control scheme in inverter.	BTL-2	Understanding	CO 3
	PART –B			
1.	Draw the block diagram of the solar PV system and describe the principle of operation in detail. (13)	BTL-1	Remembering	CO 3
2.	Draw the schematic diagram of standalone solar photovoltaic system. What are the main components used in it? Explain their functions. (13)	BTL-6	Creating	CO 3
3.	(i).Explain with neat diagram the philosophy of operation of a solar source fed boost converter. (8) (ii). Point out the delicacies involved in sizing the solar arrays. (5)	BTL-4 BTL-4	Analyzing Analyzing	CO 3
4.	Draw the schematic diagram of Buck-Boost converter and explain the operation in detail. (13)	BTL-5	Evaluating	CO 3
5.	Describe in detail about non isolated PV power conditioning system. (13)	BTL-2	Understanding	CO 3
6.	Interpret double diode configuration for PV cell. (13)	BTL-3	Applying	CO 3
7.	Describe the following in detail: (i). AC voltage controller. (8) (ii). Voltage control in PWM inverters. (5)	BTL-2	Understanding	CO 3

8.	(i). Explain the working of AC-DC-AC converter with circuit and wave form for wind energy conversion. (6) (ii). Analyze the principle of working of buck-boost converter with time ratio and current limit control. Draw the circuit and necessary waveforms. (7)	BTL-4 BTL-4	Analyzing Analyzing	CO 3 CO 3
9.	Discuss the following (i). Selection of inverters. (6) (ii). Battery sizing and Array sizing. (7)	BTL-2	Understanding	CO 3
10.	(i). Discuss the three phase uncontrolled rectifiers in details. (8) (ii). Give short notes on inverters. (5)	BTL-2 BTL-2	Understanding Understanding	CO 3
11.	(i). Describe the principle and operation of line commutated converters in inverse mode. (8) (ii). Describe principle of operation of PWM inverter and describe how it is used for wind energy conversion (5)	BTL-1	Remembering	CO 3
12.	Draw the power circuit of grid interactive inverters and explain its operation in detail. (13)	BTL-1	Remembering	CO 3
13.	Illustrate the working and operation of a matrix converter with a neat diagram and explain its limitations. (13)	BTL-3	Applying	CO 3
14.	Explain the different modes of operation of PV fed Buck-Boost converter in detail. (13)	BTL-1	Remembering	CO 3
15.	Illustrate with a neat diagram, a power electronic circuit to interface wind electrical system to the grid. (13)	BTL-3	Applying	CO 3
16.	Describe any two power conditioning schemes used in photovoltaic systems. (13)	BTL-4	Analyzing	CO 3
17.	Discuss on line commutated inverter in detail. (13)	BTL-2	Understanding	CO 3
PART-C				

1.	Design a suitable grid interactive inverter for distributed generation system. (15)	BTL-6	Creating	CO 3
2.	A DC-DC converter has an input voltage of 200V and a load of 20 ohm resistance. When converter is on, its voltage drop is 1.5V and the chopping frequency is 10 KHz. If the duty cycle is 80%, find (i) average output voltage (ii) RMS output voltage, and (iii) chopper on time. (15)	BTL-6	Creating	CO 3
3.	A single phase fully controlled convener is used for obtaining a regulated D.C output voltage. The RMS value of the A.C input voltage is 230 V, and the firing angle is maintained at 60° so that the load current is 4A. (i) Calculate D.C output voltage and active and reactive power input. (ii) Calculate the above quantities if a freewheeling diode are used at the output. The firing angle is maintained at 60° assuming the same load with resistance. (15)	BTL-5	Evaluating	CO 3
4.	Design and implement a suitable converter for a 20 kW wind turbine generator. The converter should consists of a phase controlled rectifier and a DC/DC boost converter. Assume suitable data and components necessary for design and implementation. (15)	BTL-5	Evaluating	CO 3
5.	Discuss the Sizing of Photovoltaic System. (15)	BTL-5	Evaluating	CO 3

UNIT IV - <u>ANALYSIS OF WIND AND PV SYSTEMS</u>				
SYLLABUS: Standalone operation of fixed and variable speed wind energy conversion systems and solar system- Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system.				
PART – A				
Q.No	**Questions**	**BT Level**	**Competence**	**Course Outcome**
1.	Label the basic block diagram of WECS.	BTL-1	Remembering	CO 4

2.	Illustrate about slip concept used in wind energy conversion system.	BTL-3	Applying	CO 4
3.	Why pitch angle control is used for WECS? Justify.	BTL-5	Evaluating	CO 4
4.	Discuss stand-alone operation of fixed speed WECS? State its advantages.	BTL-2	Understanding	CO 4
5.	Distinguish between fixed speed and variable speed wind energy conversion system.	BTL-2	Understanding	CO 4
6.	Discuss some of the standards used for grid integration.	BTL-2	Understanding	CO 4
7.	List few grid connection requirement of renewable power System.	BTL-1	Remembering	CO 4
8.	Show how the power quality issues that affect wind power integration.	BTL-3	Applying	CO 4
9.	What are the major problems associated with grid interconnections of WECS.	BTL-4	Analyzing	CO 4
10.	Mention some of the issues in stand- alone solar system.	BTL-1	Remembering	CO 4
11.	Point out the issues created in grid integrated PMSG based WECS.	BTL-4	Analyzing	CO 4
12.	Show the schematic diagram of grid integrated SCIG based WECS.	BTL-3	Applying	CO 4
13.	Define grid integrated solar system.	BTL-1	Remembering	CO 4
14.	Point out the problems in grid integrated solar system.	BTL-4	Analyzing	CO 4
15.	Classify the types of WECS based on the rotational speed of turbines.	BTL-6	Creating	CO 4
16.	What are the advantages of variable speed wind turbine conversion system?	BTL-2	Understanding	CO 4
17.	What are the classifications in wind energy conversion system based on electrical power output?	BTL-4	Analyzing	CO 4
18.	List out the problems involved in grid connection.	BTL-1	Remembering	CO 4
19.	List out the functions of a charge controller in PV system.	BTL-1	Remembering	CO 4
20.	Why solar tracking / orientation is needed in concentrating type of solar collectors?	BTL-3	Applying	CO 4
21.	Give the structure of solar energy conversion system	BTL-1	Remembering	CO 4

22.	What is limited variable speed WECS	BTL-1	Remembering	CO 4
23.	Discuss the use of battery storage system in standalone WECS	BTL-2	Understanding	**CO 4**
24.	Name the types of charge controller used in PV system	BTL-2	Understanding	**CO 4**
	PART –B			
1.	Draw the general structure of variable speed wind energy conversion for standalone system. Explain the functions of components used. Mention the merits and demerits of variable speed wind energy conversion. (13)	BTL-1	Remembering	CO 4
2.	Explain stand-alone operation of fixed and variable speed solar energy. (13)	BTL-4	Analyzing	CO 4
3.	Give a short notes on (i). Grid integrated PMSG (8) (ii). SCIG based WECS (5)	BTL-2	Understanding	CO 4
4.	Explain the standalone operation of (i). Fixed speed wind energy conversion system. (5) (ii). Variable speed wind energy conversion system. (5) (iii). State the advantages of fixed speed system over Variable speed systems. (3)	BTL-5	Evaluate	CO 4
5.	Show the various grid connected issues and its impact on system stability. (13)	BTL-3	Applying	CO 4
6.	Explain the operation of solar model in grid integrated system with and without battery backup. (13)	BTL-4	Analyzing	CO 4
7.	Write a brief note on stand – alone operation of fixed and fully variable speed WECS. (13)	BTL-4	Analyzing	CO 4
8.	Discuss the need for Grid integrated of wind energy system? With power electronic interface circuit, explain how grid integration is done for Permanent Magnet Synchronous Generator (PMSG) based wind energy conversion system. (13)	BTL-2	Understanding	CO 4
9.	Describe about SCIG based WECS. (13)	BTL-1	Remembering	CO 4
10.	Describe standalone operation of solar energy	BTL-1	Remembering	CO 4

	conversion system. (13)			
11.	Discuss in detail the grid system characteristics and explain with a neat diagram the standalone and grid integrated solar system. (13)	BTL-2	Understanding	CO 4
12.	Explain about grid integrated PMSG based WECS. (13)	BTL-4	Analyzing	CO 4
13.	Explain the operation of fixed speed and semi variable mode of wind energy conversion system with neat sketch (13)	BTL-1	Remembering	CO 4
14.	(i). Discuss the factors that affects the output of the PV System. (7) (ii). Compare standalone system and grid connected system with respect to operation issues (6)	BTL-6	Creating	CO 4
15.	Explain the stand alone operation of fixed speed wind energy conversion system (13)	BTL-1	Remembering	CO 4
16.	Explain the Components of Wind Turbine (13)	BTL-1	Remembering	CO 4
17.	Explain the operation of variable speed wind energy conversion system with neat diagram. (13)	BTL-1	Remembering	CO 4
	PART- C			
1.	Explain the design of controller for a DFIG based WECS. (15)	BTL-6	Creating	CO 4
2.	Explain in detail about grid integrated solar system. (15)	BTL-4	Analyzing	CO 4
3.	Specify the IEEE standards for grid connection of WECS. (15)	BTL-5	Evaluate	CO 4
4.	Explain the grid related problems in wind farms and refer the performance improvements of generator controls. (15)	BTL-5	Evaluate	CO 4
5.	Explain the Grid integration PV and Wind Energy Systems (15)	BTL-5	Evaluate	CO 4

UNIT V - HYBRID RENEWABLE ENERGY SYSTEMS	
SYLLABUS: Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).	
PART - A	

Q.No	Questions	BT Level	Competence	Course Outcome
1.	Define hybrid systems.	BTL-1	Remembering	CO 5
2.	Compose the need for hybrid energy systems.	BTL-6	Creating	CO 5
3.	Explain the range of hybrid systems.	BTL-4	Analyzing	CO 5
4.	Summarize the advantage of the hybrid energy Systems.	BTL-5	Evaluating	CO 5
5.	List out some of the hybrid systems used in industries.	BTL-1	Remembering	CO 5
6.	Classify the types of hybrid system.	BTL-4	Analyzing	CO 5
7.	Point out the merits of wind-diesel hybrid system.	BTL-4	Analyzing	CO 5
8.	Label the schematic diagram of PV-Diesel hybrid system.	BTL-1	Remembering	CO 5
9.	Show the advantages of PV-Diesel hybrid system.	BTL-3	Applying	CO 5
10.	Define charge controller used for wind energy conversion system.	BTL-1	Remembering	CO 5
11.	Explain MPPT.	BTL-5	Evaluating	CO 5
12.	Show the need for maximum power point tracking.	BTL-3	Applying	CO 5
13.	What will happen if no load is connected to a solar PV system?	BTL-6	Creating	CO 5
14.	List the merits of Hybrid RES over the isolated RES.	BTL-1	Remembering	CO 5
15.	Define smart power tracker.	BTL-2	Understanding	CO 5
16.	Label the schematic diagram of grid interactive solar PV system.	BTL-1	Remembering	CO 5
17.	Summarize the importance of MPPT in the operation of a photovoltaic system.	BTL-2	Understanding	CO 5
18.	Discuss the major features of hybrid system.	BTL-2	Understanding	CO 5
19.	Classify the types of pumps used for solar water pumping Applications.	BTL-3	Applying	CO 5
20.	What is MPPT in PV system?	BTL-2	Understanding	CO 5
21.	Write the concept of MPPT	BTL-1	Remembering	CO 5
22.	List out the need for hybrid renewable energy systems	BTL-1	Remembering	CO 5
23.	List the advantages of PV diesel energy systems	BTL-2	Understanding	CO 5
24.	What are the characteristics of Distributed energy systems	BTL-2	Understanding	CO 5
PART –B				

1.	Explain the hybrid energy conversion system with neat sketch. (13)	BTL-4	Analyzing	CO 5
2.	Explain MPPT techniques for WECS. (13)	BTL-4	Analyzing	CO 5
3.	(i). Summarize the importance of MPPT in the operation of photovoltaic system. (8) (ii). Explain various strategies used for the operation of an MPPT. (5)	BTL-5 BTL-5	Evaluating Evaluating	CO 5
4.	Discuss different hybrid systems configurations consisting of wind turbine and solar power plant. (13)	BTL-1	Remembering	CO 5
5.	Show the power electronic system used for hybrid solar photovoltaic and wind energy system and explain its operation. Discuss the technical challenges associated in it. (13)	BTL-3	Applying	CO 5
6.	Discuss and classify the working of MPPT in a solar PV system. (13)	BTL-2	Understanding	CO 5
7.	Discuss with case study how to get maximum power generation in wind energy conversion system. (13)	BTL-2	Understanding	CO 5
8.	Show with case study how to get maximum power generation in solar energy conversion system. (13)	BTL-3	Applying	CO 5
9.	With a neat sketch, describe the operation of PV-Diesel hybrid System. (13)	BTL-1	Remembering	CO 5
10.	Draw and describe the operation of Wind-PV hybrid system. (13)	BTL-1	Remembering	CO 5
11.	What is called Maximum Power Point Tracking (MPPT)? List out the different types of MPPT algorithm used for solar photovoltaic system with its salient features. Explain the use of MPPT for hybrid wind and photovoltaic energy system. (13)	BTL-1	Remembering	CO 5
12.	Explain the factors to be considered for placing the wind PV system. Discuss its plant details, operating period and environmental aspects for assumed residential load. (13)	BTL-6	Creating	CO 5
13.	List the different types of MPPT algorithm. Explain the Incremental conductance MPPT algorithm with a neat flow chart. (13)	BTL-4	Analyzing	CO 5

14.	Describe the importance of hybrid renewable energy systems with neat sketch (13)	BTL-1	Remembering	CO 5
15.	Define hybrid system? Discuss the need for hybrid system and its range and type. (13)	BTL-2	Understanding	CO 5
16.	Explain the configuration switched hybrid energy systems with neat sketch (13)	BTL-2	Understanding	CO 5
17.	Explain the role of MPPT technique used for PV power generation System. (13)	BTL-4	Analyzing	CO 5
	PART – C			
1.	Design solar PV pump and clearly explain the accessories required. Also justify the importance of implementing MPPT for the pump system. (15)	BTL-6	Creating	CO 5
2.	Illustrate the economic aspects of hybrid energy systems. (15)	BTL-5	Evaluating	CO 5
3.	Summarize the Micro hydro – PV hybrid system. (15)	BTL-5	Evaluating	CO 5
4.	Illustrate the types of PV-Diesel Hybrid Systems. (15)	BTL-6	Creating	CO 5
5.	Design the MPPT Controller for PV System. (15)	BTL-6	Creating	CO 5

CO PO PSO MAPPING

Course Outcomes	Program Outcomes												Program Specific Outcomes			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	1	2	2	1	-	-	1	-	-	-	-	3	-	-
CO2	3	2	2	1	-	1	-	-	2	-	3	1	1	2	-	-
CO3	3	2	1	2	2	2	1	-	1	-	-	-	-	1	-	1
CO4	3	3	3	2	2	1	-	-	2	-	2	1	-	-	2	-
CO5	3	2	1	1	1	2	2	-	1	-	-	2	3	-	-	-