U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: VI**

Branch: Institutional Elective **Duration: 3 hrs.**

Course Code: 23EE6OE1SW **Max Marks: 100**

Course: Solar and Wind energy Technologies

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		What is the broad classification of energy supplies? Represent them with the help of energy flow diagrams showing the position of the intercepting device (D).	*CO1*	*PO7*	**10**
	b)		Draw the block diagram showing renewable energy embedded into a grid network which is connected to finite energy supply as well with feedback control. Is Negative feedback control suitable for renewable energy supplies? Explain	*CO1*	*PO7*	**10**
			OR			
2	a)		Draw the block diagram showing the natural renewable energy currents on earth indicating the form of energy and its end use.	*CO1*	*PO7*	**10**
	b)		Explain the principles to be applied in efficient use of Renewable energy?	*CO1*	*PO7*	**10**
			UNIT - II			
3	a)		What is the objective behind two axis tracking of solar collectors? Explain. Give the expressions for different components of solar radiation on a tilted collector surface with two axis tracking.	*CO3*	*PO3*	**10**
	b)		Calculate the sun rise time, sun set time and day length hours in Chennai (13.08^{O}N, 80.27^{O}E) on 22 nd of October.	*CO2*	*PO2*	**06**
	c)		Compare the thermopile sensors and photodiode sensors used in solar radiation measurement instruments.	*CO3*	*PO3*	**04**
			OR			
4	a)		Illustrate with the help of diagrams different components of solar insolation striking a tilted collector surface along with equations for each component.	*CO2*	*PO2*	**10**

		b)	With the help of a diagram explain the working of a Angstrom compensated type pyrheliometer.	*CO3*	*PO3*	**06**
		c)	Define i) Declination angle (δ) ii) Solar altitude angle (β)	*CO2*	*PO2*	**04**
			UNIT - III			
	5	a)	Classify different technologies used for manufacturing of PV cells.	*CO3*	*PO3*	**10**
		b)	Describe the process of forming amorphous silicon PV cells or modules. Mention the advantages of thin film silicon over the conventional crystalline silicon.	*CO3*	*PO3*	**10**
			OR			
	6	a)	Obtain an expression for voltage across a PV module having n cells with one cell being shaded by drawing suitable diagrams.	*CO3*	*PO3*	**08**
		b)	BP2150S, 150 Wp PV module is operating at 1 - Sun insolation and ambient temperature of 30^{O}C. The module has a NOCT of 47^{O}C. The manufacturer data for the module are : V_{oc} at STC is 42.8 V, temperature coefficient of voltage is -0.37%/^{O}C, temperature coefficient of power is -0.5%/^{o}C. Estimate the cell temperature, open circuit voltage, power output of the module and percentage change in power output at the operating conditions given above.	*CO3*	*PO3*	**08**
		c)	What is the function of blocking diodes? Show their connection in a PV array?	*CO3*	*PO3*	**04**
			UNIT - IV			
	7	a)	Draw the block diagram of a standalone PV system and explain its operation. Mention the obligation on the users of standalone PV systems?	*CO3*	*PO3*	**10**
		b)	A buck boost converter is connected at the output of a PV array. The output of the buck boost converter supplies the load. If V_{oc} and I_{sc} are the open circuit voltage and short circuit current of the PV array respectively. Find the load voltage and current in terms of V_{oc} and I_{sc} at a duty cycle i) D = $\frac{1}{3}$ ii) D = $\frac{2}{3}$ of the buck boost converter.	*CO3*	*PO3*	**06**
		c)	Bring out the relationship between energy efficiency and coulomb efficiency of a battery.	*CO3*	*PO3*	**04**
			OR			
	8	a)	Draw the block diagram of a grid connected PV system. explain its operation. What are the advantages and disadvantages of a grid connected PV system?	*CO3*	*PO3*	**10**

		b)	Illustrate the effect of module mismatch if Two PV modules each of 180 Wp connected in parallel produce peak power at (30V, 6A) and (36 V ,5A) respectively. Sketch the I-V characteristics of the parallel combination and find the peak power output, corresponding voltage and current output.	*CO3*	*PO3*	**06**
		c)	Explain the meaning of "peak hours "approach in design of PV systems.	*CO3*	*PO3*	**04**
			UNIT - V			
	9	a)	Obtain an expression for the power in the wind.	*CO2*	*PO2*	**06**
		b)	Mention the environmental impacts of wind turbines	*CO1*	*PO7*	**06**
		c)	With the help of a block diagram explain any one scheme of grid connected wind to electric power conversion system.	*CO4*	*PO3*	**08**
			OR			
	10	a)	What is the impact of tower height and roughness of the surface on wind velocity? Explain.	*CO2*	*PO2*	**06**
		b)	What are the advantages of a Wind Farm? Mention the guidelines followed in tower spacing in a wind farm.	*CO4*	*PO3*	**06**
		c)	With the help of a neat diagram explain the construction of a horizontal axis wind turbine.	*CO4*	*PO3*	**08**

****