

**Government College (Autonomous), Rajahmundry**  
**Department of Physics 2025-26**  
**I-B.Sc (Honours) RENEWABLE ENERGY MANAGEMENT**  
**SEMESTER-I**  
**Course I: Renewable Energy Resources –I**  
**QUESTION BANK**

**Essay Questions**

<b>Q.No</b>	<b>Question</b>	<b>Marks</b>	<b>BT</b>	<b>CLO</b>	<b>PLO</b>	<b>PI</b>
<b>Unit-1</b>						
1	Explain the classification of energy sources.	7	BT1	CLO1	PLO1	1.1.1
2	Write the importance of renewable energy sources and give examples.	7	BT2	CLO1	PLO1, PLO7	1.2.1, 7.1.2
<b>Unit-2</b>						
3	Explain the classification of solar cells.	7	BT3	CLO2	PLO1	1.4.1
4	Define solar constant and explain how to determine it.	7	BT3	CLO2	PLO1	1.1.2
5	Describe the solar radiation distribution spectrum.	7	BT2	CLO2	PLO1	1.1.2
<b>Unit-3</b>						
6	Write the principle of wind energy conversion and explain.	7	BT1	CLO3	PLO1	1.1.1
7	Explain the types of wind turbines.	7	BT3	CLO3	PLO1, PLO4	1.4.2, 4.1.1
<b>Unit-4</b>						
8	Briefly explain about tidal energy technologies.	7	BT2	CLO4	PLO1	1.4.1
9	Explain ocean thermal energy conversion methods.	7	BT2	CLO4	PLO1, PLO4	1.4.3, 4.1.2
10	Briefly explain about wave energy technologies.	7	BT2	CLO4	PLO1	1.4.1
<b>Unit-5</b>						
11	Explain biomass conversion technologies.	7	BT3	CLO5	PLO1, PLO4	1.4.1, 4.1.2
12	Explain briefly about wet process and dry process.	7	BT1	CLO5	PLO1	1.4.3
13	Explain about the aerobic and anaerobic process.	7	BT2	CLO5	PLO1	1.4.3

## Short Answer Questions

Q.No	Question	Marks	BT	CL O	PLO	PI
<b>Unit-1</b>						
14	Define energy and write their units.		3	BT 1	CL O1	PLO1 1.1.1
<b>Q.No</b>	<b>Question</b>	<b>Marks</b>	<b>BT</b>	<b>CLO</b>	<b>PLO</b>	<b>PI</b>
15	Explain the green footprint concept briefly.	3	BT2	CLO1	PLO7	7.1.2
16	Define erg, calorie.	3	BT1	CLO1	PLO1	1.1.1
17	Define watt, horse power.	3	BT1	CLO1	PLO1	1.1.1
<b>Unit-2</b>						
18	Write the applications of solar PV systems.	3	BT4	CLO2	PLO1, PLO4	1.4.2
19	Explain first generation of solar cells.	3	BT3	CLO2	PLO1	1.4.1
20	Write the applications of solar PV modules.	3	BT3	CLO2	PLO1	1.4.1
21	What are the key elements of solar cell?	3	BT1	CLO2	PLO1	1.1.1
<b>Unit-3</b>						
22	Write the conditions for site selection to establish a wind turbine.	3	BT2	CLO3	PLO1	1.2.2
23	Explain the origin of wind.	3	BT1	CLO3	PLO1	1.1.1
<b>Unit-4</b>						
24	Write the nature of tidal energy.	3	BT1	CLO4	PLO1	1.1.1
<b>Unit-5</b>						
25	Define bio energy. What are the resources of it?	3	BT1	CLO5	PLO1	1.1.1
26	What are the properties of biomass sources?	3	BT1	CLO5	PLO1	1.4.1
27	Explain photosynthesis.	3	BT1	CLO5	PLO1	1.1.1
28	What are the usable forms of biomass?	3	BT1	CLO5	PLO1	1.2.2

**Question Bank**  
**Government College (Autonomous), Rajahmundry Department of Physics**  
**I-B.Sc(Honours) RENEWABLE ENERGY MANAGEMENT**  
**Semester-I( w.e.f., 2025-26 batch)**  
**Course2 : Mechanics and Properties of matter**

**UNIT I**

Q.No	Question	Marks	BT	CLO	PLO	PI
1	State and explain Newton's laws of motion with suitable examples.	7	BT2	CLO1	PLO1	1.1.1
2	Derive the equation of motion for a rocket using the law of conservation of momentum.	7	BT3	CLO1	PLO1 PLO2	1.2.2, 3.2.1
3	Explain the law of conservation of energy and momentum in the case of collisions.	7	BT2	CLO1	PLO1	1.2.1
4	Derive the expression for Rutherford scattering and define impact parameter and scattering cross-section.	7	BT4	CLO1	PLO1	1.4.1, 3.2.1
5	What is variable mass system? Give one example.	3	BT1	CLO1	PLO1	1.1.1
6	Define impact parameter.	3	BT1	CLO1	PLO1	1.1.1
7	What is meant by scattering cross-section?	3	BT1	CLO1	PLO1	1.1.1
8	What is the difference between elastic and inelastic collision?	3	BT2	CLO1	PLO1	1.2.1, 3.2.1

**UNIT II**

9	Define central force. Explain its characteristics with examples.	7	BT 2	CL O2	PLO 1	1.1.1
10	Prove that a central force is conservative and can be expressed as a negative gradient of potential energy.	7	BT 3	CL O2	PLO 1, 3	1.2.2, 3.2.1
11	Derive Kepler's laws of planetary motion.	7	BT 4	CL O2	PLO 1	1.4.1
12	Explain the concept of motion of satellites and describe geostationary satellites.	7	BT 2	CL O2	PLO 1	1.2.2, 7.1.2
13	Define central force with one example.	3	BT 1	CL O2	PLO 1	1.1.1
14	What is meant by a conservative force?	3	BT 1	CL O2	PLO 1	1.1.1
15	Write any two characteristics of central forces.	3	BT 1	CL O2	PLO 1	1.1.1
16	Define geostationary satellite.	3	BT 1	CL O2	PLO 1	1.1.1

**UNIT III**

17	Define stress and strain. Explain the three elastic moduli.	7	BT2	CLO3	PLO1	1.1.1
18	Explain Poisson's ratio and its physical significance.	7	BT2	CLO3	PLO1	1.2.1
19	Describe the theory of bending of beams and explain cantilever and uniform bending.	7	BT3	CLO3	PLO1, PLO4	1.4.1, 4.1.2
20	Explain the working principle and uses of a torsional pendulum.	7	BT2	CLO3	PLO1	1.1.1
21	Define stress.	3	BT1	CLO3	PLO1	1.1.1
22	Define strain.	3	BT1	CLO3	PLO1	1.1.1
23	Write the SI unit of Young's modulus.	3	BT1	CLO3	PLO1	1.1.1
24	What is Poisson's ratio?	3	BT1	CLO3	PLO1	1.1.1

#### UNIT IV

25	Differentiate between streamline and turbulent flow. Define Reynolds number.	7	BT2	CLO4	PLO1	1.1.1
26	State and derive Bernoulli's theorem.	7	BT3	CLO4	PLO1,	1.4.1,
27	Explain any two applications of Bernoulli's theorem.	7	BT3	CLO4	PLO1, PLO4	1.4.2, 4.1.2
28	State Poiseuille's law and give a qualitative explanation. Also write about surface tension with examples.	7	BT2	CLO4	PLO1	1.2.1
29	Define Reynolds number.	3	BT1	CLO4	PLO1	1.1.1
30	What is surface tension?	3	BT1	CLO4	PLO1	1.1.1
31	Write the equation of continuity.	3	BT1	CLO4	PLO1	1.1.1
32	What is meant by viscosity?	3	BT1	CLO4	PLO1	1.1.1

#### UNIT V

33	Explain the Michelson–Morley experiment and its significance.	7	BT2	CLO5	PLO	1.1.1
34	State the postulates of the Special Theory of Relativity.	7	BT1	CLO5	PLO1	1.1.1
35	Derive the Lorentz transformation equations.	7	BT4	CLO5	PLO1, PLO3	1.4.1, 3.2.1
36	Derive the mass–energy equivalence relation $E=mc^2$	7	BT3	CLO5	PLO1	1.4.2
37	What is Galilean relativity?	3	BT1	CLO5	PLO1	1.1.1
38	Define time dilation.	3	BT1	CLO5	PLO1	1.1.1

**Government College (Autonomous), Rajahmundry**  
**Department of Physics**  
**I-B.Sc(Honours) RENEWABLE ENERGY MANAGEMENT**  
**SEMESTER-II**  
**w.e.f., 2025-26 batch**  
**Course 3 : RENEWABLE ENERGY RESOURCES - II**  
**QUESTION BANK**

**Essay-Type Questions**

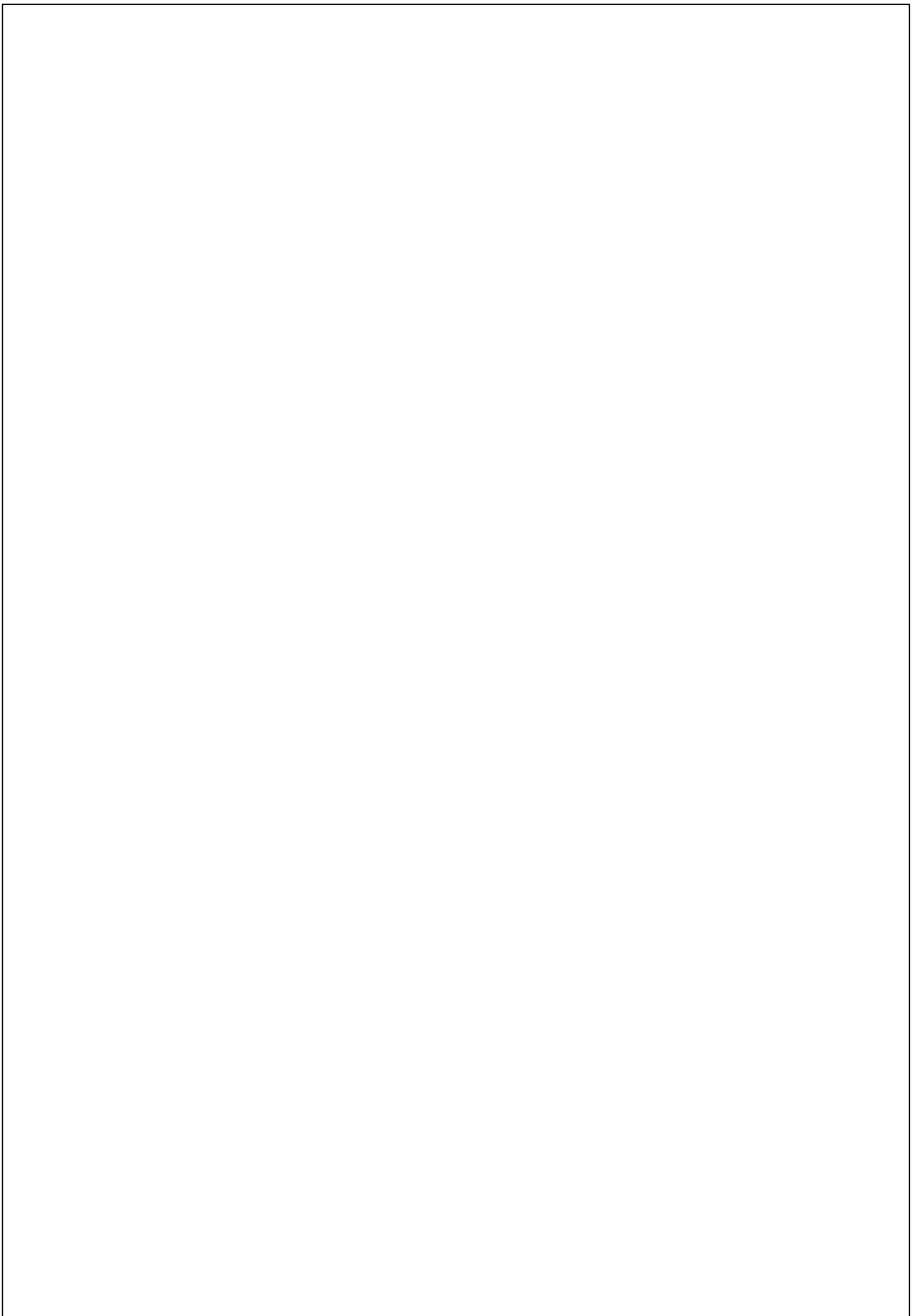
<b>UNIT</b>	<b>Question</b>	<b>Marks</b>	<b>BT</b>	<b>CLO</b>	<b>PLO</b>	<b>PI</b>
1	Explain Global Energy Scenario and Energy Trilemma Index.	7	BT2	CLO1	PLO1	1.1.2
1	Describe energy resources available in India and NGT functions.	7	BT2	CLO1	PLO7	7.2.1
1	Describe the governance of energy sector in India and Evaluate the future of renewable energy in India	7	BT2, BT5	CLO1, CLO10	PLO2	2.2.1 7.2.3
2	Explain origin and types of geothermal energy resources.	7	BT2	CLO2	PLO1	1.1.2
2	Explain hydrothermal and hot dry rock geothermal systems.	7	BT3	CLO2	PLO2	2.2.1
2	Analyze advantages and limitations of geothermal energy	7	BT4	CLO2	PLO7	7.2.1
3	Explain classification of hydropower plants.	7	BT2	CLO3	PLO1	1.1.2
3	Explain hydrological cycle and components of hydroelectric plant.	7	BT3	CLO3	PLO1	1.4.1
3.	Explain the principle of hydropower generation.	7	BT2	CLO3	PLO1	1.1.2
4	Explain radioactivity and binding energy.	7	BT2	CLO4	PLO1	1.1.2

4	Explain working of nuclear reactors.	7	BT3	CLO4	PLO1	1.4.1
4	Discuss materials used in nuclear reactors.	7	BT2	CLO4	PLO1	1.1.1
5	Explain environmental effects of thermal and nuclear power plants.	7	BT3	CLO5	PLO10	7.2.2
5	Discuss environmental effects of solar and wind energy systems.	7	BT4	CLO5	PLO10	7.2.3
5	Explain ozone depletion and global warming	7	BT2	CLO5	PLO10	7.2.1

#### Short Answer Questions from each Unit

UNIT	Question	Marks	BT	CLO	PLO	PI
1	What is renewable energy and energy governance	3	BT1	CLO1	PLO1, PLO2	1.1.
1	What is Energy Trilemma Index?	3	BT1	CLO1	PLO1	1.1. 1
1	Define energy security and functions of NGT.	3	BT1	CLO1	PLO1	1.1. 1
11	Define geo-pressured resources.	3	BT1	CLO2	PLO1	1.1. 1
11	Define magma resources.	3	BT1	CLO2	PLO1	1.1. 1
11	Applications and Limitations of geothermal energy.	3	BT1	CLO2	PLO1	1.2. 2
111	Define hydropower and hydrology.	3	BT1	CLO3	PLO1	1.1. 1
111	What is a hydrograph and Define mass curve.	3	BT1	CLO3	PLO1	1.1. 1

111	Advantages and disadvantages of hydropower.	3	BT1	CLO3	PLO7	7.2.1
1V	Define nuclear fusion.	3	BT1	CLO4	PLO1	1.1.1
IV	What is nuclear chain reaction?	3	BT1	CLO4	PLO1	1.1.1
IV	What is mass defect and binding energy	3	BT1 BT 1	CLO4 CLO4	PLO1 PLO1	1.1.1 1.1.1.1
V	What causes air pollution in power plants?	3	BT2	CLO5	PLO10	7.2.1
V	What is global warming?	3	BT1	CLO5	PLO10	7.2.1
V	Define solar energy harvesting.	3	BT1	CLO5	PLO1	1.1.1



**I B.Sc RENEWABLE ENERGY MANAGEMENT**  
**Semester II Course: Major 3**  
**WAVES AND OPTICS - Question Bank**

**UNIT-I: SIMPLE HARMONIC, DAMPED & FORCED OSCILLATIONS**  
**LONG ANSWER (ESSAY) QUESTIONS**

Q.No	Question	CLO	PLO	BTL	PI Code
1	Derive the differential equation of a simple harmonic oscillator and obtain its solution. Discuss its physical characteristics.	CLO2	PLO1	BTL-2	1.1.2
2	Explain damped harmonic oscillations. Derive expressions for logarithmic decrement, relaxation time, and quality factor.	CLO3	PLO2	BTL-3	2.2.1
3	Obtain the solution of the differential equation for forced oscillations and discuss resonance.	CLO4	PLO3	BTL-4	3.3.3

**SHORT ANSWER QUESTIONS**

Q.No	Question	CLO	PLO	BTL	PI Code
1	Define simple harmonic motion with examples.	CLO1	PLO1	BTL-1	1.1.1
2	What is logarithmic decrement?	CLO2	PLO1	BTL-1	1.1.1
3	Define the quality factor of an oscillator.	CLO2	PLO2	BTL-2	2.1.1
4	What is resonance in forced oscillations?	CLO3	PLO2	BTL-2	2.2.1

**UNIT-II: VIBRATING STRINGS AND BARS**  
**ESSAY QUESTIONS**

1	Derive the equation for transverse waves on a stretched string and obtain its solution.	CLO3	PLO1	BTL-3	1.3.2
2	Discuss longitudinal vibrations in bars and obtain solutions.	CLO3	PLO2	BTL-3	2.2.1
3	Explain the working principle of a tuning fork with necessary theory.	CLO4	PLO3	BTL-	3.3.1

**SHORT ANSWER QUESTIONS**

1	What is a stationary wave?	CLO1	PLO1	BTL-1	1.1.1
2	Write the wave equation for longitudinal vibrations.	CLO2	PLO1	BTL-2	1.1.2
3	Mention the boundary conditions for a bar fixed at both ends.	CLO4	PLO2	BTL-3	2.2.1
4	State any three applications of vibrating strings.	CLO5	PLO1	BTL-1	1.2.1

**UNIT-III: INTERFERENCE**  
**LONG ANSWER (ESSAY) QUESTIONS**

1	Explain the principle of superposition and conditions for interference of light.	CLO2	PLO1	BTL-2	1.1.2
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- |   |   |                       |
|---|---|-----------------------|
| 2 | Describe Fresnel's biprism experiment and explain how wavelength of light is determined.  | CLO3 PLO2 BTL-3 2.2.1 |
| 3 | Explain Newton's rings experiment and derive the expression for wavelength determination. | CLO4 PLO3 BTL-4 3.3.4 |

### SHORT ANSWER QUESTIONS

- |   |   |                       |
|---|---|-----------------------|
| 1 | What is coherence?                      | CLO1 PLO1 BTL-1 1.1.1 |
| 2 | What causes colors in thin films?       | CLO2 PLO2 BTL-2 2.1.1 |
| 3 | Define fringe width.                    | CLO2 PLO1 BTL-2 1.1.2 |
| 4 | Write the applications of interference. | CLO5 PLO1 BTL-1 1.2.1 |

### UNIT-IV: DIFFRACTION

#### LONG ANSWER (ESSAY) QUESTIONS

- |   |  |                         |
|---|--|-------------------------|
| 1 | Distinguish between Fresnel and Fraunhofer diffraction.                    | CL O4 PL O3 BTL-4 3.3.3 |
| 2 | Explain Fraunhofer diffraction due to a single slit with necessary theory. | CL O3 PL O2 BTL-3 2.2.1 |
| 3 | Explain the construction and working of a zone plate.                      | CL O4 PL O3 BTL-4 3.3.4 |

#### SHORT ANSWER QUESTIONS

- |   |  |                           |
|---|--|---------------------------|
| 1 | What is diffraction?                                       | CLO1 O1 PL O1 BTL-1 1.1.1 |
| 2 | Define half period zone.                                   | CL O2 PL O1 BTL-2 1.1.2   |
| 3 | What is a zone plate?                                      | CL O2 PL O2 BTL-2 2.1.1   |
| 4 | State one difference between interference and diffraction. | CL O4 PL O3 BTL-4 3.3.3   |

### UNIT-V: POLARIZATION

#### ESSAY QUESTIONS

- |   |  |                         |
|---|--|-------------------------|
| 1 | Explain various methods of polarization of light.                            | CL O2 PL O1 BTL-2 1.1.2 |
| 2 | Describe the construction and working of Nicol prism with suitable diagrams. | CL O3 PL O2 BTL-3 2.2.1 |
| 3 | Describe Nicol prism as a polarizer and analyzer.                            | CL O4 PL O3 BTL-4 3.3.4 |

#### SHORT ANSWER QUESTIONS

- |   |  |                       |
|---|--|-----------------------|
| 1 | State Malus law.                             | CLO2 PLO1 BTL-2 1.1.2 |
| 2 | What is a quarter wave plate?                | CLO2 PLO1 BTL-2 1.1.2 |
| 3 | Explain Brewster's law and its significance. | CLO3 PLO2 BTL-3 2.2.1 |
| 4 | Mention the applications of polarized light. | CLO5 PLO1 BTL-1 1.2.1 |

**GOVERNMENT COLLEGE (A) ::RAJAMAHENDRAVARAM**

**DEPARTMENT OF PHYSICS**

**II B.Sc., RENEWABLE ENERGY- SEMESTER III**

**COURSE—5 - RENEWABLE ENERGY SOURCES-II**

(As Approved in the BOS meeting held on 15 Aug 2025-26)

**QUESTION BANK**

**UNIT–I : GLOBAL ENERGY SCENARIO**

**Essay Questions**

<b>Sl.No</b>	<b>Question</b>	<b>BT</b>	<b>CLO</b>	<b>PLO</b>
1	Discuss the global energy scenario with special reference to the Energy Trilemma Index.	4	1	2
2	Evaluate the governance of the Indian energy sector in ensuring sustainable energy growth.	5	1	2
3	Explain the challenges and opportunities of meeting future energy demand in developing countries.	2	1	1
4	Compare the energy resources available in India and their potential contribution to self-sufficiency.	4	1	2
5	Assess the role of National Green Tribunal (NGT) in regulating environmental aspects of energy production.	5	1	4

**Short Answer Questions**

6	Define Energy demand and explain its significance.	1	1	1
7	What is the Energy Trilemma Index?	2	1	1
8	Name two major energy resources available in India.	1	1	1
9	Write a short note on the importance of sustainable energy governance.	2	1	1
10	Mention two key activities of NGT in the Indian energy context.	1	1	4

**UNIT–II : GEOTHERMAL ENERGY**

**Essay Questions**

11	Explain the origin of geothermal energy and its relation to Earth's internal heat.	2	2	1
12	Describe the types of geothermal resources with suitable diagrams.	2	2	1
13	Illustrate the basic extraction mechanisms of geothermal energy in hydrothermal and hot dry rock resources.	3	2	3
14	Compare the geo-pressured and magma resources in terms of availability and challenges.	4	2	2
15	Evaluate the advantages and limitations of geothermal energy in comparison with fossil fuels.	5	2	2

### Short Answer Questions

16	What are hydrothermal resources? Give an example.	2	2	1
17	Mention two advantages of geothermal energy.	1	2	1
18	Differentiate between dry steam and flash steam plants.	4	2	2
19	What is the role of hot dry rock resources in geothermal power production?	2	2	1
20	List two countries leading in geothermal energy utilization.	1	2	1

### UNIT-III : HYDROPOWER

#### Essay Questions

21	Analyze the worldwide status of hydropower and its role in renewable energy.	4	2	2
22	Discuss the essential elements of a hydroelectric power plant with a neat schematic.	2	2	1
23	Evaluate the advantages and disadvantages of hydropower plants in comparison with thermal plants.	5	2	2
24	Explain the classification of hydropower plants with examples.	2	2	1
25	Assess the importance of hydrology and storage concepts in hydroelectric power generation.	5	2	2

#### Short Answer Questions

26	What is a hydrograph?	1	2	1
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27	Define the hydrological cycle and its importance.	2	2	1
28	List any two factors for site selection of a hydroelectric plant.	3	2	3
29	What is a mass curve in hydrology?	1	2	1
30	Mention two advantages of small hydropower systems.	2	2	1

#### **UNIT-IV : NUCLEAR ENERGY**

##### **Essay Questions**

31	Describe the construction, working, and classification of nuclear reactors.	2	3	1
32	Compare the pressurized water reactor (PWR) and boiling water reactor (BWR).	4	3	2
33	Discuss the importance of mass defect and binding energy in the release of nuclear energy.	2	3	1
34	Explain the working principle and advantages of fast breeder reactors.	3	3	3
35	Evaluate the potential of nuclear fusion reactors as a future energy source.	5	3	2

##### **Short Answer Questions**

36	What is mass defect?	1	3	1
37	Define binding energy per nucleon.	1	3	1
38	List two materials commonly used in nuclear reactors.	1	3	1
39	Mention any two types of gas-cooled reactors.	2	3	1
40	Write one advantage and one limitation of nuclear energy.	4	3	2

#### **UNIT-V : ENVIRONMENTAL IMPACTS OF ENERGY**

##### **Essay Questions**

41	Assess the environmental impacts of thermal, nuclear, hydro, geothermal, wind, solar, and bioenergy production.	6	4	4
42	Discuss the effects of air and water pollution due to energy production.	2	4	4
43	Evaluate the impact of ozone layer depletion and global warming caused by fossil fuels.	5	4	4
44	Explain the biological damage caused by environmental degradation from energy systems.	2	4	4

### Short Answer Questions

- |    |   |   |   |   |
|----|---|---|---|---|
| 45 | List any two environmental effects of thermal power plants.               | 1 | 4 | 4 |
| 46 | What are the environmental effects of nuclear power plants?               | 2 | 4 | 4 |
| 47 | Mention two ways in which wind energy harvesting impacts the environment. | 4 | 4 | 4 |
| 48 | Define global warming in the context of energy utilization.               | 1 | 4 | 4 |
| 49 | Suggest any two methods to reduce air pollution from energy production.   | 3 | 4 | 3 |

**GOVERNMENT COLLEGE (A) :: RAJAMAHENDRAVARAM**  
**DEPARTMENT OF PHYSICS**

**II B.Sc., RENEWABLE ENERGY- SEMESTER III**  
**COURSE—6 - ELECTRICAL & ELECTRONIC INSTRUMENTATION**

(As Approved in the BOS meeting held on 15 Aug 2025-26)

**QUESTION BANK**

**UNIT I**

**Essay Questions**

<b>Sl.No</b>	<b>Question</b>	<b>BT</b>	<b>CLO</b>	<b>PLO</b>
1	Derive the expression for RMS value of alternating current and explain its significance.	2	CLO1	PLO1
2	Analyze the phasor diagram of a series RLC circuit at resonance and derive the resonance frequency.	4	CLO1	PLO2
3	Compare star and delta connections with suitable diagrams and applications.	2	CLO2	PLO1
4	Explain the concepts of active power, reactive power, and power factor in three-phase systems.	3	CLO2	PLO2
5	Evaluate the causes and effects of low power factor and suggest methods of improvement including APFC panels.	5	CLO2	PLO3

**Short Answer Questions**

6	Define RMS value of alternating current.	1	CLO1	PLO1
7	Write the condition for series resonance in an RLC circuit.	1	CLO1	PLO2
8	Differentiate between three-phase three-wire and three-phase four-wire systems.	2	CLO2	PLO1
9	What is the significance of power factor in AC circuits?	3	CLO2	PLO2
10	Mention any two methods of power factor improvement.	1	CLO2	PLO3

**UNIT II**

**Essay Questions**

11	Explain the different types of conductors, cables, and wire joints used in electrical installations.	2	CLO3	PLO1
12	Discuss the working and applications of MCB, ELCB, MCCB, and RCCB.	2	CLO3	PLO2
13	Describe the types of earthing, methods to improve earth resistance, and working of an earth tester.	3	CLO3	PLO3
14	Compare PMMC and MI meters with respect to construction, working, and applications.	4	CLO4	PLO1
15	Evaluate the installation, testing, and estimation methods of electrical wiring systems.	5	CLO4	PLO3

**Short Answer Questions**

16	What is the importance of National Electrical Code?	1	CLO3	PLO1
17	Define SWG and mention its use.	2	CLO3	PLO2
18	List two types of common electrical accessories.	1	CLO3	PLO1
19	Write a short note on digital multimeters.	2	CLO4	PLO2
20	What is the function of a megger?	3	CLO4	PLO3

**UNIT III**

**Essay Questions**

21	Draw and explain the V-I characteristics of a semiconductor diode.	2	CLO5	PLO1
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22	Compare the performance of half-wave and full-wave rectifiers with reference to ripple factor.	4 CLO5 PLO2
23	Explain the working of zener diode as a voltage stabilizer with a neat diagram.	3 CLO5 PLO3
24	Discuss the concept of DC and AC load lines in a transistor amplifier.	2 CLO6 PLO1
25	Evaluate the applications of a transistor as switch, oscillator, and multivibrator.	5 CLO6 PLO3
<b>Short Answer Questions</b>		
26	Define ripple factor.	1 CLO5 PLO1
27	Differentiate between centre-tap rectifier and bridge rectifier.	4 CLO5 PLO2
28	What is the function of a filter circuit in a rectifier?	2 CLO5 PLO2
29	State one application of a zener diode.	1 CLO5 PLO3
30	Draw the symbolic representation of a BJT.	1 CLO6 PLO1

## UNIT IV

### Essay Questions

31	Explain Faraday's laws of electrolysis and their applications.	2 CLO7 PLO1
32	Discuss the construction, working, charging methods, and maintenance of a lead-acid battery.	3 CLO7 PLO2
33	Compare primary cells, secondary cells, and hybrid cells with examples.	4 CLO7 PLO2
34	Explain the working principle of inverter, UPS, and battery charger.	2 CLO8 PLO1
35	Evaluate the applications of DIAC and TRIAC in voltage control and dimmer circuits.	5 CLO8 PLO3

### Short Answer Questions

36	Define electrolysis.	1 CLO7 PLO1
37	List two types of secondary cells.	1 CLO7 PLO2
38	What is the function of an IC voltage regulator?	2 CLO8 PLO2
39	Mention two uses of an UPS in electrical systems.	3 CLO8 PLO3
40	State one advantage of a TRIAC over a DIAC.	4 CLO8 PLO3

## UNIT V

### Essay Questions

41	Discuss the types of substations and their components with neat diagrams.	2 CLO9 PLO1
42	Analyze the advantages of DC transmission and high-voltage AC transmission.	4 CLO9 PLO2
43	Explain the domestic service line rules and bus bar system with examples.	2 CLO9 PLO1
44	Describe the laws of illumination and explain their applications in lighting calculations.	3 CLO10 PLO2
45	Evaluate the National Policy on Safety, Health and Environment at Workplace (NPSHEW) and its impact on electrical safety.	5 CLO10 PLO3

### Short Answer Questions

46	List two advantages of HVDC transmission.	1 CLO9 PLO2
47	What is the function of a circuit breaker?	2 CLO9 PLO3
48	Define luminous flux and luminous intensity.	1 CLO10 PLO2
49	Mention two types of lamps used in illumination.	1 CLO10 PLO2
50	What is the role of PPEs in electrical safety?	3 CLO10 PLO3

# GOVERNMENT COLLEGE (A) :: RAJAMAHENDRAVARAM

DEPARTMENT OF PHYSICS  
II B.Sc., RENEWABLE ENERGY - SEMESTER III  
COURSE—7 - THERMODYNAMICS & FLUID MECHANICS  
(As Approved in the BOS meeting held on 15 Aug 2025-26)

## QUESTION BANK

### ESSAY QUESTIONS

#### Unit – I

Q.No		BT	CLO	PLO
1	Explain the First Law of Thermodynamics and based on this law explain isothermal, adiabatic, isochoric and isobaric processes.	BL2	CLO1	PLO1
2	Explain the Zeroth Law of Thermodynamics and mention the extensive and intensive properties used in thermodynamics.	BL2	CLO1	PLO1
3	Define heat capacity and explain its relation with internal energy and enthalpy during the isochoric and isobaric processes.	BL1, BL2	CLO1	PLO1

#### Unit – II

4	Derive the expression for the change in entropy in reversible and irreversible processes.	BL2	CLO2	PLO1, PLO2
5	Explain the important parts of Carnot's engine and derive the expression for the efficiency of Carnot's engine using Carnot's reversible cycle.	BL2	CLO2	PLO1, PLO2
6	Define phase change and explain the phase change diagrams of pure substances using (a) temperature–volume diagram and (b) pressure–volume diagram.	BL1	CLO2	PLO1

#### Unit – III

7	Explain the working of a four-stroke spark ignition engine with a neat diagram and explain the theoretical P–V diagram of the four-stroke Otto cycle engine.	BL2	CLO3	PLO1
---	--	-----	------	------

- |   |  |     |      |               |
|---|--|-----|------|---------------|
| 8 | Explain the working of a four-stroke compression ignition engine with a neat diagram and explain the theoretical P–V diagram of the four-stroke Diesel cycle engine. | BL2 | CLO3 | PLO1          |
| 9 | Explain the working of open-cycle and closed-cycle gas turbine engines using the Brayton cycle and derive the expression for efficiency of the Brayton cycle.        | BL2 | CLO3 | PLO1,<br>PLO2 |

#### **Unit – IV**

- |    |   |             |      |      |
|----|---|-------------|------|------|
| 10 | State and prove Bernoulli's equation and mention its limitations. | BL1,<br>BL2 | CLO4 | PLO1 |
| 11 | Explain the working of a Venturimeter with a neat diagram.        | BL2         | CLO4 | PLO1 |
| 12 | Explain various types of fluid flow in detail.                    | BL2         | CLO4 | PLO1 |

#### **Unit – V**

- |    |   |     |      |      |
|----|---|-----|------|------|
| 13 | What is a wind mill and derive the expression for the efficiency of a wind mill.                        | BL1 | CLO5 | PLO1 |
| 14 | Explain in detail the construction and working of various geothermal energy systems with neat diagrams. | BL2 | CLO5 | PLO1 |
| 15 | Derive the expression for tidal range power and power available in ocean waves.                         | BL2 | CLO5 | PLO1 |

### **SHORT ANSWER QUESTIONS**

#### **Unit – I**

- |   |   |     |      |      |
|---|---|-----|------|------|
| 1 | Write about thermodynamic systems with suitable examples. | BL1 | CLO1 | PLO1 |
| 2 | Explain the various temperature scales.                   | BL2 | CLO1 | PLO1 |
| 3 | Explain briefly about thermodynamic potentials.           | BL2 | CLO1 | PLO1 |
| 4 | Explain the thermodynamic properties of a system.         | BL2 | CLO1 | PLO1 |

#### **Unit – II**

- |   |   |     |      |      |
|---|---|-----|------|------|
| 5 | What is entropy and explain its significance.       | BL1 | CLO2 | PLO1 |
| 6 | Explain the Second Law of Thermodynamics in detail. | BL2 | CLO2 | PLO1 |

- |   |  |     |      |      |
|---|--|-----|------|------|
| 7 | Distinguish between reversible and irreversible processes.   | BL2 | CLO2 | PLO2 |
| 8 | Explain briefly the phase change diagrams for pure substances using temperature–volume representation. | BL2 | CLO2 | PLO1 |

**Unit – III**

- |    |   |     |      |      |
|----|---|-----|------|------|
| 9  | Describe the working of a steam engine with a neat diagram.                           | BL2 | CLO3 | PLO1 |
| 10 | Compare two-stroke and four-stroke spark ignition engines.                            | BL4 | CLO3 | PLO2 |
| 11 | Describe briefly the ideal jet propulsion cycle with a T–S diagram.                   | BL2 | CLO3 | PLO1 |
| 12 | Derive the expression for the efficiency of a Rankine engine using the Rankine cycle. | BL2 | CLO3 | PLO2 |

**Unit – IV**

- |    |   |     |      |      |
|----|---|-----|------|------|
| 13 | Explain the properties of fluids.                       | BL2 | CLO4 | PLO1 |
| 14 | Distinguish between Newtonian and Non-Newtonian fluids. | BL4 | CLO4 | PLO2 |
| 15 | Explain the working of a syphon.                        | BL2 | CLO4 | PLO1 |
| 16 | Give a short note on Euler’s equations of motion.       | BL2 | CLO4 | PLO1 |

**Unit – V**

- |     |   |     |      |      |
|-----|---|-----|------|------|
| S17 | Write about heat of formation and heat of reaction.       | BL2 | CLO5 | PLO1 |
| 18  | Explain the T–S diagram of a steam turbine.               | BL2 | CLO5 | PLO1 |
| 19  | Explain the working of a gas turbine.                     | BL2 | CLO5 | PLO1 |
| 20  | Derive the expression for power available in ocean waves. | BL2 | CLO5 | PLO2 |

**GOVERNMENT COLLEGE (A) ::  
RAJAMAHENDRAVARAM DEPARTMENT OF PHYSICS  
II B.Sc., RENEWABLE ENERGY- SEMESTER III  
COURSE—8 - WAVE OPTICS  
(As Approved in the BOS meeting held on 15 Aug 2025-26)**

QUESTION BANK

**UNIT-I : INTERFERENCE**

**Essay Questions**

<b>Sl.No</b>	<b>Question</b>	<b>BT</b>	<b>CLO</b>	<b>PLO</b>
1	Explain the conditions necessary for interference of light and the physical significance of each.	BL2	CLO1	PLO1
2	Describe Lloyd's single mirror experiment and derive the expression for fringe width.	BL3	CLO1	PLO3
3	Explain Newton's rings in reflected light and determine the wavelength of monochromatic light using the experiment.	BL3	CLO1	PLO3
4	Discuss interference in thin films (plane parallel and wedge-shaped) and explain the origin of colors.	BL2	CLO1	PLO1
5	Explain the Michelson interferometer and its use in determination of wavelength.	BL4	CLO1	PLO2

**Short Answer Questions**

<b>Sl.No</b>	<b>Question</b>	<b>BT</b>	<b>CLO</b>	<b>PLO</b>
6	Define phase change on reflection in interference.	BL1	CLO1	PLO1
7	What is the difference between interference by division of wavefront and division of amplitude?	BL2	CLO1	PLO1
8	State Stokes' treatment for phase change on reflection.	BL1	CLO1	PLO1
9	Mention one application of Newton's rings.	BL3	CLO1	PLO3
10	Define fringe width in interference.	BL1	CLO1	PLO1

**UNIT-II : DIFFRACTION**

### Essay Questions

- 11 Distinguish between Fresnel and Fraunhofer diffraction with examples. BL2 CLO2 PLO1
- 12 Derive the expression for Fraunhofer diffraction at a single slit. BL3 CLO2 PLO3
- 13 Explain diffraction grating and determine the wavelength of light using diffraction grating. BL3 CLO2 PLO3
- 14 Discuss the resolving power of a diffraction grating and its significance. BL4 CLO2 PLO2
- 15 Explain Fresnel's half-period zones and the working principle of a zone plate, comparing it with a convex lens. BL2 CLO2 PLO1

### Short Answer Questions

- 16 Define Fresnel diffraction. BL1 CLO2 PLO1
- 17 What is a plane diffraction grating? BL1 CLO2 PLO1
- 18 Mention one application of diffraction grating interferometer. BL3 CLO2 PLO3
- 19 Define resolving power of grating. BL2 CLO2 PLO1
- 20 Write a short note on zone plate. BL2 CLO2 PLO1

## UNIT-III : POLARIZATION

### Essay Questions

- 21 Explain methods of production of plane polarized light. BL2 CLO3 PLO1
- 22 Describe double refraction and Brewster's law. BL2 CLO3 PLO1
- 23 Explain Malus law and its experimental verification. BL3 CLO3 PLO3
- 24 Discuss the working of Nicol prism as polarizer and analyzer. BL3 CLO3 PLO3
- 25 Explain optical activity and determination of specific rotation using Laurent's half-shade polarimeter. BL4 CLO3 PLO2

### Short Answer Questions

- |    |   |     |      |      |
|----|---|-----|------|------|
| 26 | Define polarized light.                                     | BL1 | CLO3 | PLO1 |
| 27 | What is a quarter-wave plate?                               | BL2 | CLO3 | PLO1 |
| 28 | State Brewster's law.                                       | BL1 | CLO3 | PLO1 |
| 29 | Write one application of LCDs.                              | BL3 | CLO3 | PLO3 |
| 30 | Mention the functions of half-wave and quarter-wave plates. | BL2 | CLO3 | PLO1 |

### UNIT-IV : ABERRATIONS AND FIBER OPTICS

#### Essay Questions

- |    |   |     |      |      |
|----|---|-----|------|------|
| 31 | Explain spherical aberration and discuss methods of minimizing it.                  | BL2 | CLO4 | PLO1 |
| 32 | Describe coma, astigmatism, and curvature of field in optical systems.              | BL2 | CLO4 | PLO1 |
| 33 | Discuss chromatic aberration and the concept of achromatic doublet.                 | BL3 | CLO4 | PLO3 |
| 34 | Explain chromatism for two lenses in contact and separated by a distance.           | BL4 | CLO4 | PLO2 |
| 35 | Describe principles of fiber optic communication, its advantages, and applications. | BL2 | CLO4 | PLO1 |

#### Short Answer Questions

- |    |  |     |      |      |
|----|--|-----|------|------|
| 36 | Define monochromatic aberrations.                  | BL1 | CLO4 | PLO1 |
| 37 | What is distortion in lenses?                      | BL2 | CLO4 | PLO1 |
| 38 | Mention one method to reduce spherical aberration. | BL3 | CLO4 | PLO3 |
| 39 | List advantages of fiber optic communication.      | BL2 | CLO4 | PLO1 |
| 40 | Write one application of fiber optics.             | BL3 | CLO4 | PLO3 |

### UNIT-V : LASERS AND HOLOGRAPHY

#### Essay Questions

- |    |  |     |      |      |
|----|--|-----|------|------|
| 41 | Explain spontaneous and stimulated emission and the concept of population inversion. | BL2 | CLO5 | PLO1 |
| 42 | Describe the principle of laser operation and Einstein coefficients.                 | BL2 | CLO5 | PLO1 |
| 43 | Discuss He-Ne laser and Ruby laser and their applications.                           | BL3 | CLO5 | PLO3 |

44 Explain the basic principle of holography and its applications. BL4 CLO5 PLO2

45 Describe semiconductor lasers and their role in modern technology. BL3 CLO5 PLO3

**Short Answer Questions**

46 Define laser. BL1 CLO5 PLO1

47 What is population inversion? BL2 CLO5 PLO1

48 Mention two applications of lasers. BL3 CLO5 PLO3

49 Define holography. BL1 CLO5 PLO1

50 Write one application of semiconductor lasers. BL3 CLO5 PLO3

**SEMESTER-IV**  
**GOVERNMENT COLLEGE (A) :: RAJAMAHENDRAVARAM**  
**DEPARTMENT OF PHYSICS**

**II B.Sc., RENEWABLE ENERGY SEMESTER IV**  
**COURSE—9 –ENERGY HARVESTING SYSTEMS**  
**(As Approved in the BOS meeting held on 15-SEP-2025-26)**

No. of Hours per week: 03

Total Lectures: 45

**QUESTION BANK**

**Section-A: Essay Questions**

Unit	Question	BL	CLO	PLO	PI Code
1	Describe the spectral distribution of solar radiation and various components of radiation reaching the earth surface.	2	CLO2	PLO1	1.1.2 <sup>4</sup>
1	Compare and contrast the construction and working of Pyranometer and Pyrhelimeter.	3	CLO3	PLO1	1.3.2 <sup>5</sup>
1	Write the analysis of sun path diagram on shade analysis?	4	CLO4	PLO2	2.2.1 <sup>6</sup>
2	Describe the construction and working of flat plate solar thermal collectors.	3	CLO3	PLO1	1.3.2 <sup>7</sup>
2	Describe about various concentrated solar thermal collectors.	3	CLO3	PLO1	1.3.2 <sup>8</sup>
2	Explain the methods of Solar hot water system?	2	CLO2	PLO1	1.1.2 <sup>9</sup>
3	Describe the construction and working of solar photovoltaic cell.	2	CLO2	PLO1	1.1.2 <sup>10</sup>
3	Describe various steps involved in installation, operation and maintenance of solar PV system.	2	CLO2	PLO4	4.1.3 <sup>11</sup>
3	Explain the various steps to fabrication of solar module?	3	CLO3	PLO4	4.1.2 <sup>12</sup>
4	Describe various types of wind turbines.	2	CLO2	PLO1	1.1.2 <sup>13</sup>
4	Explain the offshore floating windmill technology. What are various challenges involved with it?	3	CLO3	PLO2	2.1.2 <sup>14</sup>
4	Explain the methods to design Tower to produce wind energy?	3	CLO3	PLO4	4.1.3 <sup>15</sup>

5	Describe the anaerobic digestion process.	1	CLO1	PLO1	1.1.1 <sup>16</sup>
5	Explain about wave energy conversion systems.	1	CLO1	PLO1	1.1.1 <sup>17</sup>
5	Explain an aerobic digestion to produce bio energy?	2	CLO2	PLO1	1.1.2 <sup>18</sup>

**Section-B: Short Answer Questions**

1	Define Zenith angle and write about air mass index.	2	CLO2	PLO1	1.1.1 <sup>19</sup>
1	Define declination, hour angle and solar azimuth angle.	2	CLO2	PLO1	1.1.1 <sup>20</sup>
1	Explain direct, diffuse radiation?	2	CLO2	PLO1	1.1.2 <sup>21</sup>
2	Describe the principle of solar thermal conversion.	3	CLO3	PLO1	1.1.2 <sup>22</sup>
2	Write about solar desalinators.	2	CLO2	PLO1	1.2.1 <sup>23</sup>
2	Explain the construction and working of a solar cooker?	2	CLO2	PLO1	1.2.2 <sup>24</sup>
2	Explain the concept of solar greenhouse?	2	CLO2	PLO1	1.2.2 <sup>25</sup>
3	Explain the use of bypass and blocking diodes in solar PV modules.	2	CLO2	PLO1	1.1.2 <sup>26</sup>
3	Explain the economics and market analysis of SPV systems.	2	CLO2	PLO4	4.1.3 <sup>27</sup>
3	Explain the Shading effect of IV characteristics of solar cell?	2	CLO2	PLO2	2.2.1 <sup>28</sup>
3	Write the challenges of PV market analysis	2	CLO2	PLO4	4.1.3
4	Explain the blade design of wind mills.	2	CLO2	PLO4	4.1.3

<b>4</b>	Write the challenges to established wind energy?	2	CLO2	PLO2	2.1.1
<b>4</b>	Explain the concept of building integration	2	CLO2	PLO1	1.2.1
<b>4</b>	Explain the methods of grid connection?	2	CLO2	PLO4	4.1.2
<b>5</b>	Explain the production of biodiesel.	2	CLO2	PLO1	1.1.2
<b>5</b>	Explain how to generate hydrogen energy?	3	CLO3	PLO4	4.1.2

**SEMESTER-IV**

**GOVERNMENT COLLEGE (A) :: RAJAMAHENDRAVARAM**

**DEPARTMENT OF PHYSICS**

**II B.Sc., RENEWABLE ENERGY -SEMESTER IV**

**COURSE—10 –ENERGY STORAGE SYSTEMS**

**(As Approved in the BOS meeting held on 15-SEP-2025-26)**

No. of Hours per week: 03

Total Lectures: 45

**QUESTION BANK**

**ESSAY QUESTIONS**

**Unit-1**

<b>Q.No</b>	<b>Question</b>	<b>BT</b>	<b>CLO</b>	<b>PLO</b>
1	Define energy storage and describe flywheel storage system	BT2	CLO1	PLO1
2	Explain electrical energy storage system using a capacitor. Discuss its working and practical applications	BT2	CLO1	PLO1, PLO4
3	Explain chemical energy storage system	BT2	CLO1	PLO1, PLO4

**Unit-2**

1	Explain Lithium, solid state and molten solvent batteries. Give their uses	BT2	CLO2	PLO1, PLO2
2	Write about Ni-Cd batteries as electro chemical energy storage devices	BT2	CLO2	PLO1
3	Write about Lead-acid batteries as electro chemical energy storage devices	BT2	CLO2	PLO1, PLO4

**Unit-3**

1	Explain the construction and working of superconducting magnetic energy storage	BT1, BT2	CLO3	PLO1
2	Explain the principle, construction and working of Electrochemical Double Layer Super Capacitor	BT2	CLO3	PLO1, PLO2

**Unit-4**

1	What is a fuel cell and write its components? Explain the principle and working of a fuel cell	BT2	CLO4	PLO1
2	Write an essay on fuel cell power plant	BT3	CLO4	PLO2,
3	Explain the performance characteristics and efficiency of a fuel cell stack	BT3	CLO4	PLO2,

**Unit-5**

1	Explain the construction and working of Alkaline fuel cell	BT2	CLO5	PLO1
2	Explain the construction and working of phosphoric acid fuel cell	BT2	CLO5	PLO1, PLO4
3	Explain the construction and working of solid oxide fuel cell	BT2	CLO5	PLO1, PLO4

## SHORT QUESTIONS

### Unit-1

- |  |     |      |            |
|--|-----|------|------------|
| 1 Explain the need for energy storage                    | BT1 | CLO1 | PLO1       |
| 2 What are different modes of energy storage?            | BT2 | CLO1 | PLO4       |
| 3 Differentiate between fossil fuels and synthetic fuels | BT3 | CLO1 | PLO2, PLO4 |

### Unit-2

- |   |     |      |      |
|---|-----|------|------|
| 1 Explain the role of carbon as electrodes in batteries | BT2 | CLO2 | PLO1 |
| 2 Differentiate between primary and secondary batteries | BT3 | CLO2 | PLO2 |
| 3 Write a note on advanced batteries                    | BT3 | CLO2 | PLO2 |

### Unit-3

- |  |     |      |      |
|--|-----|------|------|
| 1 Differentiate between batteries and capacitors | BT2 | CLO3 | PLO2 |
| 2 Write the applications of Batteries            | BT2 | CLO3 | PLO1 |
| 3 Write the applications of capacitors           | BT3 | CLO3 | PLO3 |

### Unit-4

- |   |     |      |            |
|---|-----|------|------------|
| 1 Write about fuel cell efficiency                      | BT2 | CLO4 | PLO2       |
| 2 Write the differences between fuel cell and batteries | BT3 | CLO4 | PLO3, PLO4 |
| 3 Write the advantages and disadvantages of fuel cells  | BT3 | CLO4 | PLO2       |

### Unit-5

- |   |     |      |            |
|---|-----|------|------------|
| 1 Write a short note on polymer electrolyte fuel cell | BT2 | CLO5 | PLO1       |
| 2 Write a short note on molten carbonate fuel cell    | BT2 | CLO5 | PLO4       |
| 3 What are the problems arising with fuel cell        | BT2 | CLO5 | PLO1       |
| 4 Write the applications of fuel cell                 | BT2 | CLO5 | PLO1, PLO4 |

**SEMESTER-IV**  
**GOVERNMENT COLLEGE (A) :: RAJAMAHENDRAVARAM**  
**DEPARTMENT OF PHYSICS**

**II B.Sc., RENEWABLE ENERGY -SEMESTER IV**  
**COURSE—11 –ELECTRICITY AND MAGNETISM**  
**(As Approved in the BOS meeting held on 15-SEP-2025-26)**

No. of Hours per week: 03

Total Lectures: 45

**QUESTION BANK**

**ESSAY QUESTIONS**

**Unit-1**

Q.N	Question	BT	CLO	PLO
0				
1	Define Gauss Law and apply it to Spherically symmetric system	BT2	CLO1	PLO1
2	Define Gauss law and Apply it to Cylindrically symmetric system	BT2	CLO1	PLO1, PLO4
3	Define Gauss law and Apply it to Planar system.	BT2	CLO1	PLO1, PLO4

**Unit-2**

1	Define various Electric polarizations and explain	BT2	CLO2	PLO1, PLO2
2	Define D,E,P and obtain the relation between them	BT2	CLO2	PLO1
3	Derive the Clausius Mosotti Relation	BT2	CLO2	PLO1, PLO4

**Unit-3**

1	Distinguish the classification of magnetic materials into Dia, Para and Ferro.	BT1	CLO3	PLO1
2	Explain the domain theory of ferromagnetic materials.	BT2	CLO3	PLO1
3	Explain the Quinck's tube method for determination of magnetic susceptibility.	BT3	CLO4	PLO2

**Unit-4**

1	<b>Write</b> Maxwell's equations in both integral and differential forms and write their physical significance	BT2	CLO4	PLO1
2	Derive the electromagnetic wave equation from Maxwell's equations	BT3	CLO4	PLO2, PLO4
3	State and explain Poynting's theorem?	BT3	CLO4	PLO2, PLO3

**Unit-5**

1	Derive the equations of motion for a charged particle in uniform electric fields?	BT2	CLO5	PLO1
2	Describe the motion of charged particles in crossed magnetic fields. Explain circular and helical motion with appropriate expressions.	BT2	CLO5	PLO1, PLO4
3	Explain the Hall effect. Derive the expression for Hall voltage and Hall coefficient,	BT2	CLO5	PLO1, PLO4

**SHORT QUESTIONS**

**Unit-1**

1	Explain Coulombs law and Superposition principle	BT1	CLO1	PLO1
---	--	-----	------	------

- |   |   |                     |
|---|---|---------------------|
| 2 | Obtain the relation between electric field and Electric potential             | BT2 CLO1 PLO4       |
| 3 | Obtain the electric field and potential due to continuous charge distribution | BT3 CLO1 PLO2, PLO4 |

**Unit-2**

- |   |                                  |               |
|---|----------------------------------|---------------|
| 1 | Write about Dielectric loss      | BT2 CLO2 PLO1 |
| 2 | Write about Dielectric breakdown | BT3 CLO2 PLO2 |
| 3 | Write about Dielectric Strength  | BT3 CLO2 PLO2 |

**Unit-3**

- |   |   |               |
|---|---|---------------|
| 1 | What is Bohr magneton? Derive it.   | BT2 CLO3 PLO2 |
| 2 | Define magnetic dipole moment, magnetization, magnetic susceptibility and permeability and write the relation between them. | BT2 CLO3 PLO1 |
| 3 | Write about magnetic hysteresis.  | BT3 CLO3 PLO3 |
| 4 | Explain the classification of materials into soft and hard magnets and what are their applications?                         | BT2 CLO3 PLO1 |

**Unit-4**

- |   |  |                     |
|---|--|---------------------|
| 1 | What is displacement current and why is it necessary in Maxwell's equations?       | BT2 CLO3 PLO1       |
| 2 | Define the Poynting vector. What does it represent?                                | BT2 CLO4 PLO2       |
| 3 | What happens to an EM wave when it is incident normally on a dielectric interface? | BT3 CLO4 PLO3, PLO4 |

**Unit-5**

- |   |  |               |
|---|--|---------------|
| 1 | What is the Lorentz force law?   | BT2 CLO5 PLO1 |
| 2 | Why does a charged particle move in a circular path in a uniform magnetic field? | BT2 CLO5 PLO4 |
| 3 | Define Hall coefficient. What information does it provide                        | BT2 CLO5 PLO1 |

*SEMESTER-V*

**GOVERNMENT COLLEGE (A) :: RAJAMAHENDRAVARAM**

**DEPARTMENT OF PHYSICS**

**III B.Sc., RENEWABLE ENERGY SEMESTER V**

**COURSE—12 -Modern physics**

**(As Approved in the BOS meeting held on 15-SEP-2025-26)**

**QUESTION BANK**

**UNIT-I**

**Essay Questions**

<b>S. No.</b>	<b>Question</b>	<b>BT</b>	<b>CLO</b>	<b>PLO</b>
1	Explain the Quantum Numbers associated with Vector Atom Model	BT2	CLO1	PLO1
2	Describe the Stern–Gerlach experiment and indicate the importance of the results obtained	BT2	CLO2	PLO4
3	Explain the drawbacks of Bohr’s atomic model and derive an expression for the radius of the atom	BT3	CLO1	PLO1, PLO2

**Short Answer Questions**

4	Explain L–S Coupling Scheme	BT2	CLO1	PLO1
5	Explain j–j Coupling Scheme	BT2	CLO1	PLO1
6	What is Zeeman Effect?	BT1	CLO1	PLO1

**UNIT-II**

**Essay Questions**

7	What is Raman Effect? Describe the experimental set-up to study Raman Effect and give theory	BT2	CLO2	PLO4
8	Explain rotational and vibrational spectra of molecules	BT2	CLO4	PLO1

**Short Answer Questions**

9	The exciting line is $5460 \text{ \AA}$ and the Stokes line is $5520 \text{ \AA}$ . Find the wavelength of the anti-Stokes line	BT3	CLO3	PLO2
10	Mention any four applications of Raman Effect	BT1	CLO4	PLO5
11	Compare IR, UV-Visible and Raman spectroscopy techniques	BT4	CLO4	PLO2

**UNIT-III**

**Essay Questions**

12	Describe the Davisson and Germer experiment to demonstrate the wave character of electrons	BT2	CLO2	PLO4
13	What are matter waves? Derive an expression for de-Broglie wavelength	BT3	CLO1	PLO1

14 State and explain Heisenberg's uncertainty principle for position and momentum and extend it to energy and time BT2 CLO1 PLO1

**Short Answer Questions**

15 Write the properties of matter waves BT1 CLO1 PLO1

16 Explain de-Broglie hypothesis of matter waves BT2 CLO1 PLO1

17 Calculate the de-Broglie wavelength of a proton moving with velocity  $1/20$  of the velocity of light BT3 CLO3 PLO2

**UNIT-IV**

**Essay Questions**

18 Derive Schrödinger time-dependent wave equation BT3 CLO1 PLO1

19 Derive Schrödinger time-independent wave equation BT3 CLO1 PLO1

20 Obtain an expression for the energy of a particle in a one-dimensional infinite potential well BT3 CLO3 PLO2

**Short Answer Questions**

21 Mention the basic postulates of quantum mechanics BT1 CLO1 PLO1

22 Explain the physical interpretation of wave function BT2 CLO1 PLO1

23 What is meant by Eigen functions and Eigen values? BT2 CLO1 PLO1

**UNIT-V**

24 Explain Type-I and Type-II superconductors BT2 CLO5 PLO1

25 Mention the applications of superconductors BT1 CLO5 PLO5

26 Discuss BCS theory BT2 CLO5 PLO1

27 Define critical temperature, critical magnetic field and isotope effect BT1 CLO5 PLO1

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**SYLLABUS FOR III B.Sc., RENEWABLE ENERGY**  
**COURSE—13 - SEMESTER V**  
**Energy Management & auditing**  
**(As Approved in the BOS meeting held on 15-SEP-2025-26)**  
**QUESTION BANK**

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**UNIT – I**

**Essay Questions**

S.No	Question	BT	CLO	PLO
1	Write about Indian energy scenario	BT2	CLO1	PLO1, PLO4
2	Explain energy strategy for future in India	BT3	CLO1	PLO2, PLO4
3	Explain long-term energy goals / action plan for sustainable energy	BT3	CLO1	PLO2, PLO4

**Short Answer Questions**

4	Write about Electricity Act 2003	BT1	CLO1	PLO1
5	Write a short note on energy security in India	BT2	CLO1	PLO4
6	Write a short note on Bureau of Energy Efficiency (BEE)	BT1	CLO1	PLO1

**UNIT – II**

**Essay Questions**

7	What are the various classifications of boilers	BT2	CLO2	PLO1
8	Explain the performance evaluation of boilers	BT3	CLO2	PLO2
9	What are furnaces? Classify them	BT2	CLO2	PLO1

**Short Answer Questions**

10	Explain the performance analysis of a typical furnace system	BT3	CLO2	PLO2
11	What are the parameters for selection of boilers	BT2	CLO2	PLO2
12	Write a short note on furnace waste heat recovery	BT2	CLO2	PLO4

**UNIT – III**

**Essay Questions**

13	Explain energy conservation techniques for transformers	BT3	CLO3	PLO2
14	Explain energy efficiency improvement opportunities for electrical motors	BT3	CLO3	PLO2, PLO3
15	Explain about fans and blowers	BT2	CLO3	PLO1

**Short Answer Questions**

16	Explain energy conservation in transmission lines	BT2	CLO3	PLO2
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- 17 Explain briefly about monitoring motor failures BT2 CLO3 PLO2  
18 Explain energy conservation in distribution lines and lighting systems BT3 CLO3 PLO2,

## **UNIT – IV**

### **Essay Questions**

- 19 Explain ECBC provisions under Energy Conservation Act 2021 BT2 CLO4 PLO1,  
20 What are energy conservation measures in building management and instruments BT3 CLO4 PLO2,  
21 Explain different energy auditing instruments BT2 CLO4 PLO1

### **Short Answer Questions**

- 22 Write about IR thermometer BT1 CLO4 PLO1  
23 Write about pyranometer BT1 CLO4 PLO1  
24 Write about anemometer BT1 CLO4 PLO1

## **UNIT – V**

### **Essay Questions**

- 25 Define energy audit and explain types of energy audit BT2 CLO5 PLO1  
26 Explain steps for conducting energy auditing BT3 CLO5 PLO2,

### **Short Answer Questions**

- 27 Explain data collection sheets in energy audit BT2 CLO5 PLO2

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**COURSE—14-A - Renewable Energy resources-III**  
**Semester-V**

(As Approved in the BOS meeting held on 15-SEP-2025-26)

**QUESTION BANK**

**Essay Questions**

S.No	Question	BT	CLO	PLO
1	Explain the working and efficiency of a liquid flat plate collector	BT2	CLO1	PLO1
2	Discuss flat plate air heating collectors and flat plate collectors with intermittent output	BT2	CLO1	PLO1, PLO2
3	Explain the parameters characterizing solar concentrators	BT2	CLO1	PLO1
4	Classify solar concentrators and discuss point focusing solar concentrators with applications	BT4	CLO1	PLO2, PLO3
5	Discuss the thermodynamic limits to solar concentration	BT2	CLO1	PLO1, PLO2

**Short Answer Questions**

6	Define flat plate solar collector efficiency	BT1	CLO1	PLO1
7	Mention two applications of solar concentrators	BT1	CLO1	PLO3
8	What is a point focusing solar concentrator?	BT2	CLO1	PLO1
9	List parameters that characterize solar concentrators	BT1	CLO1	PLO1
10	Explain flat plate collectors with intermittent output	BT2	CLO1	PLO1

**UNIT – II**

**Essay Questions**

11	Discuss the performance and testing of flat-plate collectors	BT2	CLO2	PLO1, PLO2
12	Explain heat transfer coefficients and optimization of heat losses in flat-plate collectors	BT2	CLO2	PLO1, PLO2
13	Describe the effect of heat capacity and dust in flat-plate collectors	BT3	CLO2	PLO2
14	Explain the working and efficiency of evacuated-tube collectors	BT2	CLO2	PLO1
15	Discuss the configuration of flat-plate collector connections	BT2	CLO2	PLO1, PLO3

**Short Answer Questions**

16	Define evacuated solar collector	BT1	CLO2	PLO1
17	What is the effect of dust on flat-plate collectors	BT2	CLO2	PLO2
18	Mention two methods to optimize heat losses in flat-plate collectors	BT3	CLO2	PLO2
19	What is the heat transfer coefficient in solar collectors	BT1	CLO2	PLO1
20	Write a short note on testing of solar collectors	BT2	CLO2	PLO1

**UNIT – III**

**Essay Questions**

21	Explain I–V characteristics of a solar cell and its parameters	BT2	CLO3	PLO1
22	Discuss the effect of variation of insolation and temperature on solar cell performance	BT4	CLO3	PLO2

23 Explain the construction of solar PV modules, panels and arrays	BT2 CLO3	PLO1
24 Discuss hot spots in PV modules and their effects	BT4 CLO3	PLO2
25 Explain Energy Payback Period (EPP) and classification of solar cells	BT2 CLO3	PLO1, PLO4

### Short Answer Questions

26 Define open-circuit voltage and short-circuit current	BT1 CLO3	PLO1
27 What is fill factor in a solar cell	BT2 CLO3	PLO1
28 Mention two types of solar cells	BT1 CLO3	PLO1
29 Explain the rating of PV modules	BT2 CLO3	PLO2
30 Write a short note on series and parallel connection of solar cells	BT2 CLO3	PLO1

## UNIT – IV

### Essay Questions

31 Explain wind energy in India and power available in the wind	BT2 CLO4	PLO1, PLO4
32 Discuss wind turbine power and torque characteristics	BT4 CLO4	PLO2
33 Describe wind rotor characteristics and wind regime analysis	BT2 CLO4	PLO1
34 Explain wind shear, turbulence and acceleration effects	BT2 CLO4	PLO2
35 Discuss wind measurement: anemometers, direction and statistics	BT3 CLO4	PLO2, PLO3

### Short Answer Questions

36 Define wind power density	BT1 CLO4	PLO1
37 Mention two local effects affecting wind energy conversion	BT1 CLO4	PLO2
38 What is an anemometer	BT2 CLO4	PLO1
39 Explain wind rotor characteristics	BT2 CLO4	PLO1
40 Write a short note on wind speed statistics	BT2 CLO4	PLO2

## UNIT – V

### Essay Questions

41 Explain airfoil lift and drag characteristics for wind turbines	BT2 CLO5	PLO1
42 Discuss axial momentum theory and blade element theory	BT2 CLO5	PLO1, PLO2
43 Describe rotor design, performance analysis and tip speed ratio	BT4 CLO5	PLO2, PLO3
44 Discuss wind energy conversion systems like wind pumps	BT4 CLO5	PLO2, PLO3
45 Explain environmental benefits and problems of wind energy	BT2 CLO5	PLO4

### Short Answer Questions

46 Define tip speed ratio	BT1 CLO5	PLO1
47 Mention two types of wind energy conversion systems	BT1 CLO5	PLO3

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**SEMESTER V**  
**COURSE—14(B )- GREEN BULDING**  
(As Approved in the BOS meeting held on 15-SEP-2025-26)

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**QUESTION BANK**

**MODULE-1**

**Essay Questions**

<b>Q.No</b>	<b>Question</b>	<b>BT</b>	<b>CLO</b>	<b>PLO</b>
1	Explain the concept of cost-effective construction and discuss the role of alternative materials in reducing building cost.	BT2	CLO1	PLO1, PLO7
2	Discuss the properties, manufacturing process, advantages and limitations of stabilized mud blocks and concrete blocks.	BT4	CLO1	PLO1, PLO2
3	Explain the use of fiber reinforced cement components and fiber reinforced polymer composites in buildings.	BT3	CLO1	PLO3
4	Describe recycling of building materials such as brick, concrete, steel and plastics and their environmental benefits.	BT4	CLO1	PLO7
5	Explain the environmental issues related to quarrying of building materials and possible mitigation measures.	BT5	CLO1	PLO7

**Short Answer Questions**

1	List advantages of laterite blocks.	BT1	CLO1	PLO1
2	What is Lime-Pozzolana cement?	BT2	CLO1	PLO1
3	Mention uses of bamboo in building construction.	BT2	CLO1	PLO7
4	Define lightweight beams.	BT1	CLO1	PLO1

**MODULE-2**

**Essay Questions**

1	Compare Flemish bond and rat trap bond with respect to material consumption and	BT4	CLO2	PLO2, PLO7
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cost effectiveness.

2	Explain ferrocement and ferroconcrete construction techniques with applications.	BT3	CLO2	PLO3
3	Discuss different precast building components and their advantages.	BT2	CLO2	PLO1
4	Explain alternative roofing systems such as filler slab and composite roof systems.	BT4	CLO2	PLO3
5	Describe the role of agencies like COSTFORD, Nirmiti Kendra and Habitat in promoting sustainable construction.	BT5	CLO2	PLO7, PLO10

#### Short Answer Questions

1	Define cavity wall.	BT1	CLO2	PLO1
2	List any two advantages of filler slab roofing.	BT2	CLO2	PLO7
3	What are precast door and window frames?	BT1	CLO2	PLO1
4	Name two ready-to-use building elements.	BT1	CLO2	PLO1

#### MODULE-3

##### Essay Questions

1	Define global warming and explain its causes and effects.	BT2	CLO3	PLO1, PLO7
2	Explain the contribution of buildings to global warming and carbon footprint.	BT4	CLO3	PLO2
3	Discuss the concept, necessity and benefits of green buildings.	BT4	CLO3	PLO7
4	Explain embodied energy in building materials and its importance.	BT3	CLO3	PLO3
5	Compare initial cost and life cycle cost of green buildings and conventional buildings.	BT5	CLO3	PLO2, PLO12

##### Short Answer Questions

1	Define carbon footprint.	BT1	CLO3	PLO1
2	List any two green building materials.	BT1	CLO3	PLO7

3	What is life cycle cost?	BT2	CLO3	PLO2
4	Mention two global efforts to reduce carbon emissions.	BT1	CLO3	PLO7

#### MODULE-4

##### Essay Questions

1	Explain the BREEAM and LEED green building rating systems.	BT2	CLO4	PLO1
2	Discuss GRIHA rating system highlighting its point system and weightage.	BT4	CLO4	PLO7
3	Explain principles of sustainable development in green building design.	BT3	CLO4	PLO3
4	Describe characteristics of sustainable buildings.	BT4	CLO4	PLO7
5	Explain integrated lifecycle design of materials and structures.	BT5	CLO4	PLO12

##### Short Answer Questions

1	Expand LEED.	BT1	CLO4	PLO1
2	What is green design?	BT2	CLO4	PLO7
3	Name two sustainably managed materials.	BT1	CLO4	PLO7
4	What is differential weightage?	BT2	CLO4	PLO1

#### MODULE-5

##### Essay Questions

1	Explain the utility of solar energy in buildings.	BT2	CLO5	PLO1
2	Discuss solar passive cooling and heating techniques.	BT4	CLO5	PLO3
3	Explain water utilization and low energy approaches to water management in buildings.	BT3	CLO5	PLO7
4	Discuss solid waste, sullage water and sewage management in green buildings.	BT4	CLO5	PLO7
5	Explain the relationship between urban environment, green cover and built	BT5	CLO5	PLO7, PLO12

environment.

**Short Answer Questions**

1	Define solar passive building.	BT1	CLO5	PLO1
2	What is green composite?	BT2	CLO5	PLO7
3	Define sullage water.	BT1	CLO5	PLO1
4	Mention two benefits of green cover.	BT2	CLO5	PLO7

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**SYLLABUS FOR II B.Sc., RENEWABLE ENERGY**

**COURSE—15 -A – Power Electronics**

**SEMESTER V**

**(As Approved in the BOS meeting held on 15-SEP-2025-26)**

**QUESTION BANK**

**UNIT – I**

**Essay Type Questions**

<b>S.No</b>	<b>Question</b>	<b>BT</b>	<b>CLO</b>	<b>PLO</b>
1	Define JFET and explain the formation of depletion region	BT2	CLO1	PLO1
2	Explain enhancement type MOSFET	BT2	CLO1	PLO1

**Short Type Questions**

3	Write a short note on CMOS	BT2	CLO1	PLO1
4	Mention the JFET parameters	BT1	CLO1	PLO1
5	Explain the basic idea of silicon controlled switch	BT2	CLO1	PLO1

**UNIT – II**

**Essay Type Questions**

6	Write the types of thyristors and explain silicon controlled rectifier	BT2	CLO2	PLO1
7	Explain the operation and characteristics of TRIAC	BT3	CLO2	PLO2

**Short Type Questions**

8	Write a short note on series and parallel combination of SCR	BT2	CLO2	PLO2
9	Write the applications of TRIAC	BT1	CLO2	PLO3
10	Write the types of thyristors	BT1	CLO2	PLO1

**UNIT – III**

**Essay Type Questions**

11	Explain the construction and working of UJT	BT2	CLO3	PLO1
12	Describe silicon unilateral switch	BT2	CLO3	PLO1

**Short Type Questions**

13	Write the applications of SUS	BT1	CLO3	PLO3
14	Describe silicon asymmetrical switch	BT2	CLO3	PLO1
15	Explain silicon bilateral switch	BT2	CLO3	PLO1

**UNIT – IV**

**Essay Type Questions**

16	Explain SCR as half wave rectifier	BT3	CLO4	PLO2
17	Explain DIAC–TRIAC phase control circuit	BT3	CLO4	PLO2

**Short Type Questions**

18	Write a short note on CMOS	BT2	CLO4	PLO1
19	Explain single phase inverter	BT2	CLO4	PLO2

20	Explain general ideas of inverters	BT2	CLO4	PLO1
21	Explain three phase inverters	BT3	CLO4	PLO2

## **UNIT – V**

### Essay Type Questions

22	Explain power conditioning for solar photovoltaic systems	BT3	CLO5	PLO2
23	Explain power electronics for wind energy systems	BT3	CLO5	PLO2

### **Short Type Questions**

24	Explain solar inverters	BT2	CLO5	PLO3
25	Explain AC–DC–AC conversion	BT2	CLO5	PLO2
26	Explain energy storage systems	BT2	CLO5	PLO4

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**SYLLABUS FOR II B.Sc., RENEWABLE ENERGY  
COURSE—15 -B – OCEAN ENERGY  
AND BIO ENERGY  
SYSTEMS SEMESTER V**

(As Approved in the BOS meeting held on 15-SEP-2025-26)

**Question Bank**

**UNIT – I :**

**Essay Questions**

<b>Q.No</b>	<b>Question</b>	<b>BT</b>	<b>CLO</b>	<b>PLO</b>
1	Explain various renewable energy resources with emphasis on ocean energy systems.	<b>BT2</b>	CLO1	PLO1
2	Discuss ocean energy potential and global status with suitable examples.	<b>BT4</b>	CLO2	PLO2
3	Describe oceanographic basics such as tides, waves, currents, thermal and salinity gradients.	<b>BT2</b>	CLO1	PLO1
4	Explain site selection criteria and resource assessment methods for ocean energy systems.	<b>BT3</b>	CLO4	PLO3
5	Discuss environmental, social and economic aspects of ocean energy utilization in a sustainable energy mix.	<b>BT5</b>	CLO3	PLO7

**Short Answer Questions**

1	Define ocean energy.	<b>BT1</b>	CLO1	PLO1
2	List advantages of ocean energy systems.	<b>BT1</b>	CLO1	PLO1
3	What are tidal currents?	<b>BT2</b>	CLO1	PLO1
4	Mention limitations of ocean energy systems.	<b>BT2</b>	CLO3	PLO7
5	State the role of ocean energy in a diversified energy mix.	<b>BT2</b>	CLO3	PLO7

**UNIT – II :**

**Essay Questions**

1	Explain tidal energy principles with tidal range and tidal stream concepts.	<b>BT2</b>	CLO1	PLO1
2	Describe types of tidal power plants with neat sketches.	<b>BT2</b>	CLO2	PLO1
3	Explain wave energy characteristics and wave power estimation methods.	<b>BT4</b>	CLO2	PLO2
4	Discuss different wave energy conversion devices and their working principles.	<b>BT4</b>	CLO2	PLO3
5	Explain grid integration issues and techno-economic challenges of tidal and wave energy with case studies.	<b>BT5</b>	CLO3	PLO2, PLO 7

**Short Answer Questions**

1	Define tidal range.	<b>BT1</b>	CLO1	PLO1
2	What is a point absorber?	<b>BT2</b>	CLO2	PLO1
3	List components of a tidal power plant.	<b>BT1</b>	CLO2	PLO1

4	What is an oscillating water column?	<b>BT2</b>	CLO2	PLO1
5	Mention two wave energy projects worldwide.	<b>BT1</b>	CLO4	PLO10

### **UNIT – III :**

#### **Essay Questions**

1	Explain the principle and thermodynamic cycles of OTEC.	<b>BT2</b>	CLO1	PLO1
2	Describe open, closed and hybrid OTEC systems with diagrams.	<b>BT4</b>	CLO2	PLO1
3	Discuss components and performance analysis of OTEC plants.	<b>BT4</b>	CLO2	PLO2
4	Explain salinity gradient energy and methods of power generation.	<b>BT2</b>	CLO1	PLO1
5	Evaluate environmental impacts and future prospects of ocean thermal and salinity gradient systems.	<b>BT5</b>	CLO3	PLO7

#### **Short Answer Questions**

1	Define OTEC.	<b>BT1</b>	CLO1	PLO1
2	What is pressure retarded osmosis?	<b>BT2</b>	CLO2	PLO1
3	Mention advantages of closed cycle OTEC.	<b>BT2</b>	CLO3	PLO7
4	What is reverse electrodialysis?	<b>BT1</b>	CLO2	PLO1
5	State two challenges of OTEC systems.	<b>BT2</b>	CLO3	PLO2

### **UNIT – IV :**

#### **Essay Questions**

1	Explain various biomass resources and their classification.	<b>BT2</b>	CLO1	PLO1
2	Discuss biomass characteristics and energy potential.	<b>BT4</b>	CLO2	PLO2
3	Explain thermochemical conversion processes of biomass.	<b>BT2</b>	CLO2	PLO1
4	Describe biochemical conversion processes of biomass energy.	<b>BT2</b>	CLO2	PLO1
5	Compare thermochemical and biochemical conversion technologies.	<b>BT5</b>	CLO3	PLO2

#### **Short Answer Questions**

1	Define bioenergy.	<b>BT1</b>	CLO1	PLO1
2	List types of biomass.	<b>BT1</b>	CLO1	PLO1
3	What is gasification?	<b>BT2</b>	CLO2	PLO1
4	Define anaerobic digestion.	<b>BT1</b>	CLO2	PLO1
5	Mention two issues in biomass storage.	<b>BT2</b>	CLO3	PLO2

### **UNIT – V :**

#### **Essay Questions**

1	Explain types and design considerations of biogas plants.	<b>BT2</b>	CLO2	PLO3
2	Discuss production and applications of liquid biofuels.	<b>BT4</b>	CLO2	PLO2
3	Explain algae-based bioenergy systems and their advantages.	<b>BT4</b>	CLO3	PLO7

- |   |   |            |      |      |
|---|---|------------|------|------|
| 4 | Describe bioenergy power plants and cogeneration systems.                             | <b>BT2</b> | CLO4 | PLO3 |
| 5 | Discuss sustainability, life cycle assessment and future trends in bioenergy systems. | <b>BT5</b> | CLO3 | PLO7 |

**Short Answer Questions**

- |   |   |            |      |       |
|---|---|------------|------|-------|
| 1 | Define bioethanol.                        | <b>BT1</b> | CLO1 | PLO1  |
| 2 | What is cogeneration?                     | <b>BT2</b> | CLO4 | PLO3  |
| 3 | Mention two advantages of algae biofuels. | <b>BT2</b> | CLO3 | PLO7  |
| 4 | What is carbon neutrality?                | <b>BT2</b> | CLO3 | PLO7  |
| 5 | List two policies promoting bioenergy.    | <b>BT1</b> | CLO4 | PLO10 |