Renewable Energy Technology (315337)

MSBTE Diploma · K-Scheme · Electrical Engineering (EE), Semester 5 · Important Questions

How this list was made: Based on MSBTE papers **W-2025 and S-2026** available on msbte.ac.in (these are the only two K-scheme papers of this course so far). Every question of both papers was grouped by topic. **High** = asked in both papers, **Medium** = asked in one paper, **Low** = in the K-scheme syllabus but not asked yet. Practice guidance only — not a prediction of the exam.

Most repeated topics

#	Topic	Unit	Times asked
1	Pyrheliometer / instruments for measuring solar radiation	1	3 (S-26, W-25)
2	Concentrating collectors – focusing vs non-focusing, parabolic trough vs heliostat, applications	1	3 (S-26, W-25)
3	Wind power terminology and power equation (cut-in speed, Betz limit, power coefficient)	2	3 (S-26, W-25)
4	Variable speed constant frequency (VSCF) scheme / constant vs variable speed turbines	2	3 (S-26, W-25)
5	Chinese (fixed dome) biogas digester	4	3 (S-26, W-25)
6	Beam (direct) and diffuse radiation – definitions / effect in a cloudy region	1	2 (S-26, W-25)
7	Solar cell – equivalent circuit and I-V characteristics	1	2 (S-26, W-25)
8	Site selection for wind energy conversion system / wind farm	2	2 (S-26, W-25)
9	Hydrogen storage methods (metal hydride, compressed gas, liquid)	3	2 (S-26, W-25)
10	Hazards and preventive measures in hydrogen handling / utilisation	3	2 (S-26, W-25)

Unit I – Solar Power Technology (20 M)

Question / topic	Marks	Asked in	Probability
Pyrheliometer / instruments for measuring solar radiation • State any four instruments used to measure solar radiation. *(W-25 Q.1b)* • Types of pyrheliometer; explain Angstrom compensation pyrheliometer with sketch. *(W-25 Q.2a)* • Define pyrheliometer and state its use. *(S-26 Q.1b)*	2 M, 4 M	S-26, W-25	**High**
Concentrating collectors – focusing vs non-focusing, parabolic trough vs heliostat, applications • Compare focusing and non-focusing concentrating collectors (five points); recommend one for industrial process heating. *(W-25 Q.6b)* • List applications of solar concentrating collectors. *(S-26 Q.1a)* • Distinguish between parabolic trough and heliostat field collector (efficiency, scalability, storage, applications). *(S-26 Q.2b)*	2 M, 4 M, 6 M	S-26, W-25	**High**

Beam (direct) and diffuse radiation – definitions / effect in a cloudy region • Define: i) direct radiation ii) diffused radiation. *(W-25 Q.1a)* • A solar plant is proposed in a cloudy region: i) which radiation will dominate ii) effect on output and how to minimise losses. *(S-26 Q.6b)*	2 M, 6 M	S-26, W-25	**High**
Solar cell – equivalent circuit and I-V characteristics • Explain solar cell with its equivalent circuit diagram and draw its I-V characteristics. *(W-25 Q.2b)* • Explain I-V characteristics of solar cell with graph. *(S-26 Q.2a)*	4 M	S-26, W-25	**High**
Flat plate collector and solar air heater • State two disadvantages and two applications of flat plate collector. *(S-26 Q.1c)* • Explain working of a solar air heater and analyse its advantages in drying applications. *(S-26 Q.6a)*	2 M, 6 M	S-26	**Medium**
Basic photovoltaic power system – block diagram • Explain the concept of basic photovoltaic system for power generation with a neat block diagram. *(W-25 Q.3a)*	4 M	W-25	**Medium**
Series / parallel connection of solar cells – modules and arrays • Explain series connection of solar cells with advantages. *(S-26 Q.3a)*	4 M	S-26	**Medium**
Materials used for solar cells • Give names of any two materials commonly used in fabrication of solar cell. *(W-25 Q.1c)*	2 M	W-25	**Medium**
Solar geometry numerical – declination, zenith angle, angle of incidence • Latitude 19° N, 15 October, 10:30 AM solar time, collector tilted at 19° facing south: find δ, θz and θ. *(W-25 Q.6a)*	6 M	W-25	**Medium**
Sunshine recorder, pyranometer, insolation, solar time / day length terms In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Unit II – Wind Power Technology (16 M)

Question / topic	Marks	Asked in	Probability
Wind power terminology and power equation (cut-in speed, Betz limit, power coefficient) • Define: i) cut-in wind speed ii) Betz limit. *(W-25 Q.1f)* • Derive the expression for power developed due to wind. *(W-25 Q.2d)* • Site with average wind speed 8 m/s – justify suitability using power coefficient concept. *(S-26 Q.6c(ii))*	2 M, 3 M, 4 M	S-26, W-25	**High**
Variable speed constant frequency (VSCF) scheme / constant vs variable speed turbines • Explain VSCF scheme in wind energy conversion with block	2 M, 6 M	S-26, W-25	**High**

diagram. *(W-25 Q.5a)* • State concept of variable speed constant frequency scheme. *(S-26 Q.1e)* • Compare constant speed and variable speed wind turbines; justify why modern turbines prefer variable speed. *(S-26 Q.5a)*			
Site selection for wind energy conversion system / wind farm • Explain any four site selection criteria for WECS. *(W-25 Q.2c)* • Suggest a suitable site for a wind farm in Maharashtra and justify. *(S-26 Q.6c(i))*	3 M, 4 M	S-26, W-25	**High**
Horizontal axis vs vertical axis wind turbine • Compare HAWT and VAWT on five points; recommend one for rooftop installation. *(W-25 Q.6c)*	6 M	W-25	**Medium**
Lift and drag forces on wind turbine blades • Explain lift and drag forces acting on wind turbine blades with sketch. *(S-26 Q.2c)*	4 M	S-26	**Medium**
Gearbox arrangement in wind turbine • Describe the need of gearbox in wind turbine with block diagram. *(S-26 Q.2d)*	4 M	S-26	**Medium**
Generators used in wind power (PMDC, synchronous, SCIG, DFIG) • State any four generators used in wind power generation. *(W-25 Q.1e)*	2 M	W-25	**Medium**
Factors affecting wind power generation • List factors affecting wind power generation. *(S-26 Q.1f)*	2 M	S-26	**Medium**
WECS block diagram, wind turbine components, pitch and yaw control In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Unit III – Hydrogen Energy and Fuel Cell (12 M)

Question / topic	Marks	Asked in	Probability
Hydrogen storage methods (metal hydride, compressed gas, liquid) • State methods of hydrogen storage; explain storage as metal hydrides. *(W-25 Q.3b)* • Describe any two methods of hydrogen storage. *(S-26 Q.3b)*	4 M	S-26, W-25	**High**
Hazards and preventive measures in hydrogen handling / utilisation • Explain preventive measures to be followed in hydrogen utilisation. *(W-25 Q.5b)* • State preventive measures for hydrogen handling. *(S-26 Q.1d)*	2 M, 6 M	S-26, W-25	**High**

Polarization in fuel cell – types, resistance (ohmic) polarization • Define polarization in fuel cell; state two types. *(W-25 Q.1d)* • Explain resistance polarization in fuel cell. *(W-25 Q.4c)*	2 M, 4 M	W-25	**Medium**
Hydrogen as fuel – advantages over conventional fuels, fuel-cell vehicle vs battery EV • Discuss four advantages of hydrogen fuel over conventional fuels. *(S-26 Q.4c)* • Compare hydrogen fuel-cell vehicle and battery electric vehicle (refuelling time, range, infrastructure, environment). *(S-26 Q.5b)*	4 M, 6 M	S-26	**Medium**
Hydrogen production (electrolysis, thermochemical, coal gasification, photo-electrolysis) In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**
Fuel cell – working principle, components, types, applications In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Unit IV – Biomass Energy (12 M)

Question / topic	Marks	Asked in	Probability
Chinese (fixed dome) biogas digester • Explain the concept of Chinese digester and state two applications. *(W-25 Q.5c)* • Write any two advantages of Chinese digester. *(S-26 Q.1g)* • Explain with neat sketch the Chinese biogas digester. *(S-26 Q.4e)*	2 M, 4 M, 6 M	S-26, W-25	**High**
KVIC (floating drum) digester / classification of biogas plants • State the various models of biogas plant. *(W-25 Q.1g)* • Describe construction and working of KVIC digester with labelled diagram. *(W-25 Q.4d)*	2 M, 4 M	W-25	**Medium**
Site selection for biogas plant • State factors to be considered while selecting site for a biogas plant. *(W-25 Q.4e)*	4 M	W-25	**Medium**
Factors affecting biogas generation (temperature, pH, retention time, feedstock) • Discuss how temperature, pH, retention time and feedstock quality affect biogas generation. *(S-26 Q.4d)*	4 M	S-26	**Medium**
Biomass conversion processes (anaerobic digestion, gasification, pyrolysis, fermentation) • Rural area with surplus agricultural waste: suggest a biomass conversion process, explain and justify. *(S-26 Q.5c)*	6 M	S-26	**Medium**
Pragati biogas plant; materials used for biogas In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Unit V – Other Renewable Sources of Energy (10 M)

Question / topic	Marks	Asked in	Probability
Binary cycle geothermal power plant • Explain binary-cycle geothermal plant; justify why preferred for low/moderate temperature resources. *(W-25 Q.4a)* • Explain binary cycle geothermal plant with diagram. *(S-26 Q.3c)*	4 M	S-26, W-25	**High**
Ocean thermal energy conversion (OTEC) – closed cycle, effect of temperature difference • Explain closed cycle OTEC with neat sketch. *(W-25 Q.3d)* • Explain how temperature difference in OTEC affects power generation and efficiency. *(S-26 Q.4a)*	4 M	S-26, W-25	**High**
Small hydro plant – working principle, turbine selection, advantages and limitations • State four advantages and limitations of small hydro power generation. *(W-25 Q.3c)* • Explain working of small hydro plant; recommend turbine for head ≤ 10 m. *(W-25 Q.4b)*	4 M	W-25	**Medium**
Site selection for small hydro plant (topography, river characteristics) • Analyse role of topography and river characteristics in selecting a small hydro plant. *(S-26 Q.4b)*	4 M	S-26	**Medium**
Tidal energy vs wave energy • Distinguish between tidal energy and wave energy on four points. *(S-26 Q.3d)*	4 M	S-26	**Medium**
Dry steam / flash steam geothermal plants; tidal power plant arrangement; marine current; mini/micro hydro classification In syllabus, not asked yet — prepare for a surprise question.	—	Not yet	**Low**

Exam tips from the two papers

- Unit marks (K-scheme specification table): Solar 20, Wind 16, Hydrogen & fuel cell 12, Biomass 12, Other sources 10. Solar and wind together carry more than half the paper.
- **Chinese (fixed dome) digester** was asked three times in two papers (2 M, 4 M, 6 M). Learn the labelled sketch, working, advantages and applications — and compare it with the KVIC floating drum plant.
- Both papers asked about **pyrheliometer**, **solar cell I-V characteristic**, **VSCF / variable speed operation**, **hydrogen storage**, **hydrogen safety**, **binary cycle geothermal** and **OTEC**.
- New-style questions (S-2026) ask you to *suggest, justify, recommend or analyse* (cloudy region, rooftop turbine, Maharashtra wind site, agricultural waste). Always end with a clear choice and 2–3 reasons.
- Numericals seen: solar angles (declination, zenith angle, angle of incidence) and wind speed suitability using power coefficient. Also practise $P = \frac{1}{2}\rho A V^3$, $P = \rho g Q H \eta$, fill factor/efficiency and

PV system sizing.

- Diagrams expected: pyrheliometer, solar cell equivalent circuit and I-V curve, PV block diagram, collectors, lift–drag, VSCF/gearbox block diagrams, fuel cell, metal hydride, KVIC and Chinese plants, binary cycle, OTEC, small hydro layout.

Note: This is a **important-question list prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in