EES Mid Sem Exam

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UG4

Q-1. Describe the link between energy conservation, role of renewable energy usage and climate change mitigation.

Ans. Energy is required for any development work. It is defined as amount of work done or amount of heat transferred over time.

Due to increasing population and industries, the demand for energy has been increased tremendously.

Till the last 20th century, the major resources for energy production were coal, oil, petroleum and other non-renewable sources.

We need to start looking to ways to meet the increased demand | to reduce climatic degradation caused by coal, oil | petroleum and to preserve non-renewable resources. for this, we have to opt for renewable resources (eg → solar energy, wind energy, tidal | geothermal energy) as they have long life and available in abundance.

We need to also start looking into energy conservation.

Energy conservation is achieved when growth of energy consumption is reduced on physical terms.

So, to reduce energy bills and increasing energy efficiency, we ~~of~~ have to opt to use renewable resources. By using these resources, they have a lot minor effect on environment. Thus, overall Earth's temperature and climate can be naturally corrected by following energy Conservation and use of renewable energy.

The three E's of Energy Environment and ~~Ecology~~ Economy are well understood by the above paradigm. It states that-

(a) The consumption rate of renewable resources is ~~not~~ higher than its recovery rate.

(b) The consumption of non-renewable resources is not higher than rate of increase in ~~the~~ renewable ~~Sours~~ sources of supply

(c) The emission of pollutants is within absorption capacity of environment.

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Q-2 Different type of solar H_2O heater technology, application and resources.

Ans A solar collector uses the sun's heat and convert it into the heat energy.

A solar water heater uses solar collector to heat the water which can be used either in household applications or industrial needs.

Components A solar water heating system consists of a either a flat plate or evacuated tube solar collector, a storage tank and connecting pipes.

→ This system is installed on roofs to get direct solar radiation with the collector connected to continuous water supply.

→ A generic principle is to mount the solar collector towards the south if living in North hemisphere or turns to ~~s~~ north if living in Southern hemisphere.

Type 1 Slab Flat Plate Collector

① It is the most common type of flat plate collector

② It uses copper tubes with black coatings.

Type 2 Solar Thermal

① This is installed with 3x300 LPD system on rooftop

② Provides better solar irradiance variation

Type 3 Evacuated Tube Collector-

① It is less dependent upon ambient temperature and works with higher temperatures

② Evacuated glass tubes are used to reach high temperatures instead of copper tubes

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Q-3 Differentiate b/w ON GRID and OFF GRID PV systems.

Ans Photovoltaic systems are used to convert solar energy to electricity directly which can used for any household and industrial needs.

But a single photovoltaic cell can't generate much power. So we have to connect them to form grid for a bigger source of generation.

Differences on next page →

Off grid vs on Grid

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Parameters	off grid	on grid
Grid Connection	It operates independently of utility power grid.	It is connected to utility power grid.
Suitability	It is easily available when utility power is not easily accessible	It is used when selling power to utility is smaller than min power load.
Storage required	Yes, we need storage here	Storage is not required here
Cost	Costs more as it an independent unit	Less expensive
Installation	Easy to install	It is complex- restricted to the utility grid.
Monitoring	Important, but not critical	Requires grid related monitoring and feedback. Safety features are required.

We have compared both ON and off GRID PV system. Each system has its own merits and demerits as compared above. So, Choose wisely.

Q-5 Describe the advantage and disadvantage of wind energy application from environmental aspects.

Ans Wind energy is a renewable source of energy. Moving wind causes the turbines to wheel around and thereby, electricity is generated.

Advantages of Wind Energy

(1) It is cost effective → Wind energy is available in market at very low prices compared to energy generated by fossil fuels/ solar energy

(2) Sustainability → Wind energy is caused by heating of atmosphere by the sun and the rotation of Earth. So, its sustainable and will continue to supply in long term as long as sun shines

(3) No environment degradation → Wind energy is a clean fuel source. There are no side by-product nor any harmful gases that can damage the environment

(4) It also reduces the use of fossil fuels. So, ~~ab~~ double attempt at saving the environment at its best.

(5) Protects wildlife by reducing the usage of fossil fuels that come from forest

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Disadvantages of Wind Power

(1) Cost of installation → It takes big amounts of money to create a wind energy power plant.

(2) Cost of storage and transportation → Since, many windmills are located far away from cities, there needs to be a cost factor to store and succesfully transport it to different destinations

(3) Noise pollution → Owing to rotation of turbines, there can be a lot of noise pollution. This affects the environment adversely.

(4) Harm to birds by spinning of turbine blades

(5) Require a lot of land (which can be cut from forest as well) to start a wind power plant. Installing too many wind power plants can affect the ~~##~~ environment.