Chettinad College of Engineering & Technology Approved by AICTE-New Delhi and Affiliated to Anna University-Chennai		
Academic Year 2024-2025		
Question Bank		
Year/Semester: IV/VII **Date:13/08/2024**	**Department : EEE** **Subject Code/Title : OCH353&Energy Technology** **Faculty Name : Dr.M.Senthil Kumar, Prof/EEE**	**Unit: I, II, III, IV,V** **Section : Part A/B/C**

UNIT – 1

INTRODUCTION

PART-A (2-MARKS)

1. What is energy?

Energy is the capacity for doing work . it may exist in potential, kinetic, thermal, electrical, chemical, nuclear, or other forms of energy are, heat and work Ie., energy will be transferred form one body to another.energy

2. Generalize the global energy scenario of conventional energy.

Fossil fuels (coal, oil, and natural gas) currently provide the majority of our energy. On a global basis, it supplies about 81% of the energy.

3. What is energy efficiency?

The amount of useful energy we can get out of a system Eg.100% energy efficient machine would change all the energy put into useful work.

4. Write about the potential of various renewable energy sources in India.

India has an estimated renewable energy potential of about 900 GW from sources like wind -102 GW, bio energy-25 GW , small Hydro -20GW and solar power -750 GW. Renewable energy enjoys 15.90% shares in total installed capacity in India. As of march 2017,renewable energy installed capacity totaled to 57,620 MW.

5. Write about sector wise energy consumption in India.

Of the total consumption for 2021, 41% was used in transport, 32% in industry (including non-energy uses),and 21% in the residential, services, and 21% agriculture sector. The remainder is consumed in power plants (1%)and in the hydrocarbon industry(5%)

6. What are the units of energy?

1. British thermal unit (BTU) 2. Kilowatt-hour (kWh) 3. Calorie 4. Electronvolts (ev)

5. Hartree (the automatic unit of energy) 6. Rydberg units 7. Barrel of oil.

7. How do we compare forms of energies?

Although there are many specific types of energy, the two major forms are kinetic energy and potential energy. Kinetic energy in moving objects or mass. Examples Include mechanicalenergy , electrical energy etc. potential energy is any form of energy that hs stored potential that can be put to future use. Examples include nuclear energy, chemical energy,etc.

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9. How is energy converted from one form to another?

Energy can change form one form to another .for example ,when we switch on lightbulb, electrical energy changes to thermal energy and light energy. A car changes energy stored in the chemical bonds of gasoline to several different forms. A chemical reaction in the engine changes chemical energy to light.

10.What are the causes of energy crisis?

i) Overconsumption ii) Over population iii) Poor infrastructure, Unexplored renewable energy options iv) Delay in commissioning of power plants v) Wastage of energy Poor distribution system, Major accidents and natural calamities, Wars and attacks Miscellaneous factors

11. Write the methods to mitigate energy crisis?

Move towards renewable resources

Buy energy efficient products

Lighting controls

Easier grid access

Energy simulation

Perform energy audit

Common stand on climate change.

12. What is energy conservation?

Energy conservation is the decision and practice of using less energy. Turing off the light when we leave the room, unplugging appliances when they are not in use and walking instead of driving are all examples of energy conservation. The two main reasons people conserve energy are to gain more control over their energy bill and reduce the demand on the earth's natural resources.

13. what is energy crisis?

The energy crisis is the concern that the world's demands on the limited natural resources that are used to power industrial society diminishing as the demand rises. these natural resources are in limited supply. while they do occur naturally, it can take hundreds of thousands of years to replenish the stores.

14. Write about renewable & non renewable energy.

Renewable resources cannot be depleted over time. Non-renewable resources deplete over time. Renewable resources include sunlight, water, wind and also geothermal sources such as hot springs and fumaroles. Non-renewable resources includes fossil fuels such as coal and petroleum.

PART B &C

1. Discuss in detail about global primary energy reserves and consumption
2. Explain in detail about Indian energy scenario in terms of energy supply and consumption.
3. What is meant by energy sources ? explain in detail these energy sources with special source with special reference to Indian context.
4. Discuss in detail about long term energy scenario for India.
5. Discuss in detail about energy units and its conversion.
6. Explain detail about causes & preventive measures of energy crisis.

UNIT -2 CONVENTIONAL ENERGY

PART A- 2 MARKS

1. Illustrate the function of boiler and turbine

The function of a boiler is to either produce hot water or stream.A turbine is a machine that transformer rotational energy from fluid that is picked up by a rotor system into usable work or energy.

2) Why is the preparation of coal necessary?

Coal preparation is required because freshy mined coals contains some impurities like heterogenous mixture of organic matter these impurities reduce coal's heating value and leave behind an undesirable ash residue.

3) Why majority of coal based thermal power plants are near seashore?

The reason behind the presence of coal based thermal power plants to be near the seashore is that water availability is in abundance which is essentially required as the coal based thermal power plants functions over a water boiler which needs water to form steam which is converted into the thermal energy.

4) Define superheated steam.

Superheated steam is steam at a temperature higher than its boiling point for the pressure which only occurs where all the water water has evaporated or been removed from the system .

5) Mention few turbines that are widely used in hydroelectric power stations

The two most co mmon types of reaction turbines are propeller (including Kaplan) and francis.kinetic turbines are also a type of reaction turbine .A propeller turbine generally has a runner with three to six blades.

6) Classify the hydro electric turbines with respect to high medium and load head.

High head .low head,medium head,high head though there is no rule regarding water head height but below 30 meters is considered as low head ,above 30 meters is called medium head and above 300 meters is known as high head hydroelectric power plant.

7) Analyze the three main factors of of power output of hydroelectric plant.

The power output from ahydro electric power plant depends on

- Head, type of dam and discharges.
- Head, discharges and efficiency of the system .
- Type of draft tube ,type of turbine and efficiency of the system.
- Type of dam, discharge and type of catchment area.

8) Define the function of surge tank in hydro plants

Surge tanks are applied in hydropower plant with long water conduits to reduce pressure forces during the acceleration of the large water masses they are constructed as intermittent water reserviours close to turbines either with open acess to atmospheric air or as a closed volume filled with pressurized air.

9) Explain the function of nuclear reactor.

Nuclear reactor are the heart of a nuclear power plant they contain and control nuclear chain reactions that produce heat through a physical process called fission .that heat is used to make steam that spins a turbine to create electricity.

10) Classify the nuclear reactors .

There are two basic types :The pressurized-water reactor(PWR)and the boiling–water reactor(BWR)

11) Explain the requirements of fission process.

Fission occurs when a neutron slams into a larger atom forcing it to excite and split into two atoms smaller –also known as fission products additional neutron are also known as released that can initiate a in reaction when each splits a tremendous amount of energy is released.

PART B&C

1.Explain with a neat sketch the various part of a thermal power plant.

2. What is nuclear fission and fusion? Explain with a neat sketch the various part of a thermal power plant.

3. Discuss merits and demerits of a hydro electric power plant.

4. What is nuclear fission and fusion? Explain with a neat sketch the various part of a thermal power plant.

5. Discuss merits and demerits of a hydro electric power plant.

6. Discuss about Fluidized fed combustion and its types.

UNIT III: NON-CONVENTIONAL ENERGY
2-Marks

1. **Express the equation for the maximum output power (Pm) of wind turbine** ?

The Power in the wind is given by the following equation

Power(W)=I/2xpxAxv^3

power=watts

P(rho,a greek letter)=denstity of the air in kg/m3

A=cross-sectional area of the wind in m2

V=velocity of the wind in m/s

2. **Define solar radiation**

Solar radiation often called the solar resource are just sunlight, is a general term for the electromagnetic radiation emitted by the sun.solar radiation can be captured and turned into useful forms of energy, such as heat and elelctricity.using a variety of technologies.However , the technical feasibility and economical operation of these technologies at a specific location depends on the available solar resources.

3. **Define solar pond**

Solar pond, any large human-made body of salt water that collects and stores solar e nergy, there by providing a sustainable sources of heat and power.

4. **What is mean by energy plantations?**

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The term energy plantation refers to be used mainly as fuel for domestic or shrubs, that are have stable in a short time period and to be used mainly as fuel for domestic or commercial purposes.

5. Compare the VAWT and HAWT

sic of Difference	**rizontal Axis wind Turbine**	**rtical axis wind turbine**
finition	horizontal axis wind turbine is one whose axis of rotation is horizontal.	wind turbine is called vertical axis wind turbine if its axis of rotation is vertical
breviated name	AWT is the abbreviation used for horizontal axis wind turbine	AWT is the abbreviation used to denote the vertical axis wind turbine.
is of rotation with respects to wind stream	r the horizontal axis of rotation of turbine is parallel to the wind stream.	r the vertical axis wind turbine, the axis of rotation of the turbine is perpendicular to the wind stream.
cation of electric generator	the horizontal axis wind turbine,the electric generator is installed at the top of the tower	the vertical axis wind turbine, the generator is installed on the ground
cation of gearbox is installed at the top of the turbine tower	HAWT, the gearbox is installed at the top of the turbine	VAWT, the gear box is installed at the top of the turbine.

6. **Explain ocean wave energy and state its advantages**.

- Environment-friendly energy source.
- Renewable source of energy.
- Reliable energy source.
- Enormous energy potential**.**

Less dependency on fossil fuels: Dependence on fossil fuels can be reduced if energy from wave Power is extracted up to its maximum. This will help curb air pollution and also provide green jobs to Millions of people.

No damage to land: Unlike fossil fuels, which cause massive damage to land as they can leave large Holes while extracting energy, wave power does not cause damage to the earth. It is safe, clean, And consistent method to produce energy from the ocean.

7. Define Geothermal Energy.

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Geothermal energy is a type of renewable energy taken from the Earth's core. It comes from heat generated during the original formation of the plant and radioactive decay of materials. This thermal energy is stored in rocks and fluids in the center of the earth.

8. Define solar thermal power plant?

Solar thermal power plants are electricity generation plants that utilize energy from the sun to heat a fluid to a high temperature. This fluid then transfers its heat to water, which then becomes superheated steam. This steam is then used to turn turbines in a power plant, and this mechanical energy is converted into electricity by a generator.

9. What is Solar Water Distillation?

Solar water distillation is the process of using energy from the sunlight to separate freshwater from salts or other contaminants. The untreated water absorbs heat, slowly reaching high temperatures. The heat causes the water to evaporate, cool, and condense into vapour, leaving the contaminants behind. Solar stills can be used for low capacity and self-reliant water supplying system.

10. What is solar dryer?

Solar dryers are used to eliminate the moisture content from crops, vegetables, and fruits. The solar dryer consists of a box made up of easily available and cheap material like cement, galvanized iron, brick, and plywood. The top surface of the dryer is covered by transparent single and double-layered sheets.

	PART-B&C
1.	Explain in detail about the construction of solar cell, solar module and solar array.
2.	Discuss in detail about the principle of solar photo Voltaic(SPV)conversion.
3.	Classify different types of solar collectors and explain any one in detail.
4.	Enlist various domestic and industrial application of solar energy.
5.	What is wind power and derive the equation of power in wind.
6	Explain the principle of operation of open cycle OTEC system
7	Explain the working of tidal power plant with neat layout and specify the site requirements
8	Classify various types of rotor used in wind turbine

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UNIT IV: BIOMASS ENERGY
2-Marks

1. **What is biomass?**

Biomass is the term used to describe any fuel derived from plants. This includes crop residues, wood, crops and animal waste. Biomass can be used for heating applications (such as wood stoves) or electricity generation in a power plant, just like burning coal.

2. **Give some of the organic materials used in biomass plant.**

The most common biomass materials used for energy are plants, wood, and waste. These are called biomass feedstocks. Biomass energy can also be a non renewable energy source.

3. **List out all the biomass conversion technologies?**

The major option within thermochemical biomass conversion processes include combustion, gasfication, pyrolysis, and liquefaction. The most practiced thermochemical conversion of biomass industrially is combustion process, which is used for heat and electricity generation.

4. **Discuss about hydrolysis?**

The reaction of water with another chemical compound results in the formation of two or more products. Some examples of hydrolysis include dissolving a salt of a weak acid or base in water or dissolving sulphuric acid in water where hydronium and bisulphate compounds are formed.

5. **Define biocrude?**

Bio-crude is a liquid biofuel produced by liquefaction of biomass using high temperature, high pressure liquid phase thermal processing. Like bio-oil, bio-crude is the organic, liquid product produced from liquefaction.

6. **What is biofuel?**

Biofuel is a type of renewable energy source derived from microbial, plant, or animal materials. Examples of biofuels include ethanol (often made from corn in the United States and sugarcane in Brazil), biodiesel (sourced from vegetable oils and liquid animal fats), green diesel (derived from algae and other plant sources), and biogas (methane derived from animal manure and other digested organic material).

7. **What are fuel cells?**

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Fuel cell is a voltaic cell, which converts the chemical energy of the fuels directly into electricity without combustion. It converts the energy of the fuel directly into electricity. In these cells, the reactants, products and electrolytes pass through the cell.

Fuel + Oxygen → Oxidation products + Electricity.

8. **Name the different types of Fuel cells.**
   - Proton exchange membrane fuel cell (PEMFC).
   - Phosphoric acid fuel cell (PAFC).
   - Solid acid fuel cell.
   - Alkaline fuel cell.
   - High temperature fuel cell.
   - Electric storage fuel cell.

9. **Write the cell reaction of alkaline fuel cell.**

Anode: $2H_2 (g) + 4(OH)^- (aq) \rightarrow 4H_2O (l) + 4e^-$

Cathode: $O_2 (g) + 2H_2O (l) + 4e^- \rightarrow 4(OH)^-(aq)$

Overall: $2H_2 (g) + O_2 (g) \rightarrow 2H_2O (l)$

10. **Write the cell reaction of solid oxide fuel cell.**

Anode reactions: $H_2 + O^{2-} \rightarrow H_2O + 2e^-$ $CO + O^{2-} \rightarrow CO_2 + 2e^-$

Cathode reaction: $O_2 + 4e^- \rightarrow 2^{2-}$

Overall reaction: $H_2 + O_2 + CO \rightarrow H_2O + CO_2$

11. **Mention the applications of fuel cell**.

- Fuel cell electric vehicles, or FCEVs, use clean fuels and are therefore more eco-friendly than internal combustion engine-based vehicles.
- They have been used to power many space expeditions including the Appolo space program.
- Generally, the byproducts produced from these cells are heat and water.
- The portability of some fuel cells is extremely useful in some military applications.
- These electrochemical cells can also be used to power several electronic devices.
- Fuel cells are also used as primary or backup sources of electricity in many remote areas.

12. What is energy storage and why is it important in industrial and commercial environments?

Energy storage involves Capture energy at times of low demand for later use when demand is high and therefore the highest costs. In industrial and commercial environments, this practice is vital to manage energy expenses, improve supply reliability and reduce dependence on non-renewable energy sources.

	PART-B&C
1.	Explain the impacts of biomass construction, production and operation.
2.	Discuss the following methods of biogas generation i. Gasification ii. Anaerobic Digestion.
3.	Describe working principle of fuel cell with neat sketch and draw the performance characteristics of alkaline fuel cell.
4.	Explain in detail about i) Solid oxide fuel cell. ii) Phosphoric acid fuel cell.
5.	With neat diagram explain about magneto hydrodynamic power generation.
6	Discuss in detail about chemical energy storage system
7	Explain the Thermal Energy storage-sensible heat energy storage system
8	Explain the roles of electrical energy storage technologies in viewpoint of generate RES.

UNIT V: ENERGY CONSERVATION

2-Marks

1. **Discuss about the importance of energy conservation**.

Energy needs to be conserved to cut costs and to preserve the resources for longer use. Conventional energy sources pollute the environment by emitting harmful gases into the atmosphere. conventional energy sources are limited and might expire one day.

2. **Give the objectives of energy management**.

The objective of Energy Management is to achieve and maintain optimum energy procurement and utilization, throughout the organization and:To minimise energy costs/waste without affecting production &quality. To minimise environmental effects.

3. **Discuss the term energy accounting**.

Energy accounting is a system used to measure, analyse and report the energy consumption of different activities on a regular basis. This is done to improve energy efficiency, and to monitor the environmental impact of energy consumption.

4.**What is the energy demand**?

Energy demand is the term used to describe the consumption of energy by human activity. It drives the whole energy system, influencing the total amount of energy used; the location of, and the type of fuel used in the energy system supply; and the characteristics of the end use technologies that consume energy.

5.**How Bureau of Energy Efficiency(BEE) facilitates energy efficiency programs in India?**

The mission of the Bureau of Energy Efficiency is to assist in developing policies and strategies with a thrust on self – regulation and market principles, within the overall framework of the energy consumption Act,2001 with the primary objective of reducing energy intensity of the Indian economy.

6.**How does a nation benefit from Energy Efficiency programs?**

Energy conservation plays a significant role in lessening climate change. It helps the replacement of non-renewable resources with renewable energy. Energy conservation often the most inexpensive solution to energy shortages, and it is more environmentally kind alternative to increased energy production.

7. **What are the components of energy management?**

An Energy management system (EnMS) allows an organisation to plan, manage, measure, and continually improves the energy performance of its facilities and comprises the following components

Roles and responsibility
Energy policy
Energy objectives and energy targets
Energy efficiency improvement plan
Monitoring, measurement and analysis

8.Give the role of energy Audit.

Energy audit will help to understand more about the ways energy and fuel are used in any industry, and help in identifying the areas where waste can occur and where scope for improvement exists.

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9. How to save energy in boilers?

- Increase Boiler Efficiency: Lower the Stack Temperature.
- Install an Economizer.
- Tune the Burner Regularly.
- Install a Variable Frequency Drive.
- Insulate Your Valves.
- Clean the Fireside.
- Preheat Combustion Air.
- Clean the Water Side.

10.Write about energy efficient dryers.

Use the right setting: Use the auto-dry setting instead of the timer.

Optimize load size: Wash one large load instead of two smaller loads.

Dry towels and cottons separately: Dry heavier items in a separate load from lighter items.

Don't over-dry: Use the moisture sensor if your dryer has one.

Clean the lint filter: Clean the lint filter after each use to improve air circulation and prevent fire hazard.

	PART-B&C
1.	Write short notes on Energy conservation in the chemical industry.
2.	List steps involved in "Detailed energy audit".
3.	Explain energy audit methods for the Boiler and its allied.
4.	Evaluate the energy conservation opportunities in a fans and blowers.
5.	With neat diagram explain about magneto hydrodynamic power generation.
6	Explain the various principle of Energy Management.
7	Explain the role of energy manager.
8	Write down the steps involved in 'Energy management Strategy'?.

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