

UNIT – I

TWO MARKS

1. List out the advantages of nuclear power station over thermal power station

- The amount of fuel required is very small
- There is no problem of transportation and storage
- Less space is required
- Most economical

2. Name the sub system of solar power plant.

- Solar energy collection system
- Thermal energy transfer system
- Thermal energy storage system
- Energy conversion system

3. Indicate the difficulties in using geo thermal energy

- Overall efficiency of power production is low
- Drilling operation is noisy
- Large areas are needed for exploitation of geo thermal energy

4. State the advantages of interconnected operation of power system

- Increased reliability of supply: in the event of power failure at one station the supply can be fed from other station
- Reduction in total installed capacity
- Spinning reserve is reduced

5. State the advantage of MHD

- Conversion efficiency is around 50%
- The closed cycle supply produces power, free of pollution
- It has no moving parts, so more reliable

6. What are the major components of nuclear power?

- Nuclear reactor
- Heat exchanger
- Steam turbine
- Alternator

7. State the principle of DG power plant.

The diesel burns inside the DG and the product of this combustion act as the fluid to produce the mechanical energy.

8. What are the classifications of wind energy conversion?

- Horizontal axis wind mill
- Vertical axis wind mill

9. Define distributed generation.

It can be defined as the integrated use of small generation units directly connected to the distribution supply or inside the facilities of a customer

10. What are the effects of system operation?

- Distributed generation
- The small scale production of electricity
- It has the potential to improve the reliability of the power supply
- Cost of electricity is reduced
- Lower emission of air pollutants

11. What are the parameters characterising solar concentrators?

- The aperture area
- The acceptance angle
- The absorber area
- Geometrical concentration ratio
- The optical efficiency
- The thermal efficiency

12. What are the advantages of solar concentrator?

- Improved thermal efficiency due to reduced heat loss area
- Increased energy delivery temperature, facilitating their dynamic match between temperature level and the task
- Increased number of thermal storage options at elevated temperatures, thereby reducing the storage cost.

13. Name the components of flat plate collector.

- An absorber plate (metallic or plastic)
- Tubes or pipes for conducting or directing the heat transfer fluid
- One or more covers
- Insulation to minimize the downward heat loss from the absorbing plate

14. What are the important factors governing the selection of site for conventional sources?

- Location of dam
- Choice of dam
- Quantity of water available
- Accessibility of site

15. What are the classifications based on plant capacity in hydro plants?

- Micro hydel plant : less than 5 MW
- Medium capacity plant : 5 to 100 MW
- High capacity plant : 101 MW to 1000 MW
- Super capacity plant : above 1000 MW

16. What are the classifications of turbine?

- Francis turbine, patented by Francis in 1849
- Pelton turbine, patented by Pelton in 1889
- Propeller and Kaplan turbine, patented by Kaplan in 1913
- Deriaz turbine, patented by Deriaz in 1945

17. Define surge tank.

Surge tanks are tanks connected to the water conductor system. It serves the purpose of reducing water hammering in pipes which can cause damage to pipes.

The sudden surges of water in penstock are taken by the surge tank, and when the water requirements increase, it supplies the collected water thereby regulating water flow and pressure inside the penstock.

18. What is the General Layout of Thermal Power Plant?

The general layout of thermal power plant consists of mainly four circuits as shown in [1]. The four circuits are

- Coal and Ash circuit
- Air and Gas circuit
- Feed Water and Steam circuit
- Cooling Water circuit

19. What are the Types of Air Heaters and give a brief introduction.

➤ *Tubular Air Heater:*

The flue gas flows outside the tubes in which the air flows heating it. To increase the time of contact horizontal baffles are provided.

➤ *Plate Type Air Heater:*

It consists of rectangular flat plates spaced 1.5 to 2 cm apart leaving alternate air and gas passages. This is not used extensively as it involves high maintenance.

20. Define Economizer:

The economizer is a feed water heater, deriving heat from the flue gases. The justifiable cost of the economizer depends on the total gain in efficiency. In turn this depends on the flue gas temperature leaving the boiler and the feed water inlet temperature.

UNIT – II

PART A

1. Define demand factor.

It is defined as the ratio of max. demand on the power station to its connected load

$$\text{Demand factor} = \text{maximum demand} / \text{connected load}$$

2. Define load factor

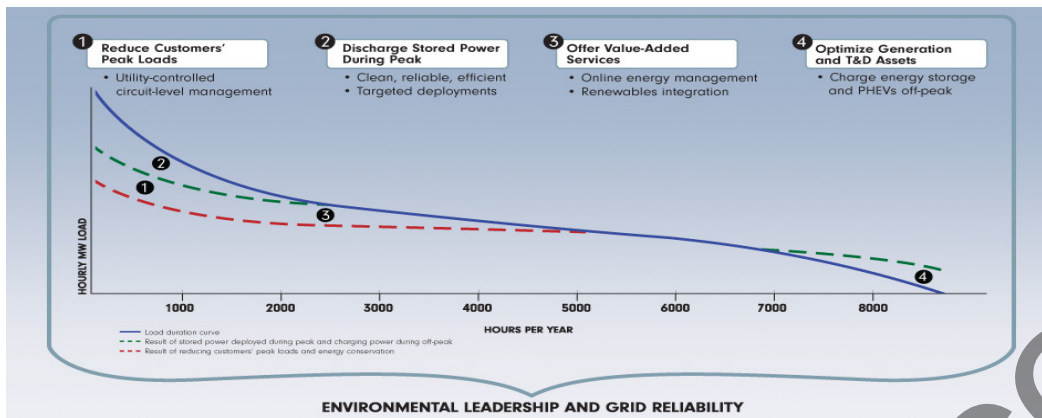
It is the ratio of average load to the maximum demand during a given period

$$\text{Load factor} = \text{average load} / \text{maximum demand}$$

3. What is load curve?

A curve showing the load demand of a consumer against time in hours of the day is known as load curve

4. Draw the load duration curve.



5. What is tariff?

Different methods of charging consumers are known as tariff or rates of payment for the consumption of electricity.

6. How can we calculate the cost of electricity?

- Sum all the operating expenses for each year of operation - fuel, O&M, consumables, etc.
- Add the carrying cost of capital – Total capacity x Fixed Charge Rate
- Divide by Kwh's produced in the year
- Yields average annual cost of electricity THB/Kwh

7. What is two part tariff?

When the rate of electrical energy is changed on the basis of maximum demand on the consumer and the units consumed, then it is called two part tariff.

8. What is energy efficient drive?

The concept of energy efficient design has develops to challenge the efficiency of induction motor especially for the rating of 37 Kw.

9. Mention the role of energy audit

An energy audit establishes both where and how the energy is being used and the potential for energy saving.

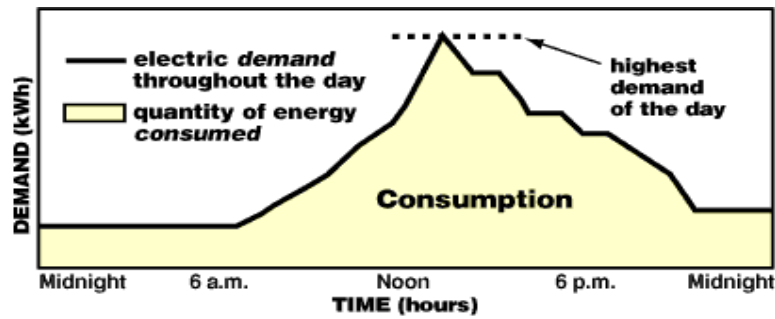
10. What are the types of energy audit?

- Preliminary energy audit
- Detailed energy audit
-

11. How to improve the power factor?

- Installing static power capacities
- Operating synchronous motor in one excited condition
- Installing static VAR compensator.

12. Draw the demand charges curve



13. What is meant by flickers?

The variation of input voltage that is insufficient duration to allow visual vibration of a change in electric light source intensity.

14. Why some utilities have cheaper rates in the evenings?

That's because it's harder for them to reach peak demand during the day when everyone's running AC. So they might charge less in the evenings to try to get you to move some of your consumption (like laundry machines) outside of those daytime hours. And even if your utility doesn't have cheaper rates at night, if you're utility has a demand charge it could pay to shift your laundry to the evenings, because running laundry + air conditioning at the same time results in a higher demand.

15. What is the long term perspective of the price of electricity?

The price of the Kilo Watt reacted slowly for two reasons which I shall so summarize:

- Most of the private producers signed contracts of delivery for very long term (20 - 30 years) for a majority of their production.
- When the production of electricity is dealt with by nationalized producers, the State prevents the prices from rising too fast by subsidizing more or less directly.
- Nevertheless, both positions can be only temporary, because a private company cannot produce infinitely at a loss and a State cannot pay ad Vitam æternam charges her of electricity of her taxpayers.

16. What is the capital cost of power plant?

This includes the cost of land, building, and equipment installation, designing and planning of the plant. It depends upon the type and location of plant.

17. What are the economics nuclear power plants?

- Nuclear power is cost competitive with other forms of electricity generation, except where there is direct access to low-cost fossil fuels.
- Fuel costs for nuclear plants are a minor proportion of total generating costs, though capital costs are greater than those for coal-fired plants and much greater than those for gas-fired plants.
- Site disposal costs are taken into account.

18. What is financing cost?

Financing costs will depend on the rate of interest on debt, the debt-equity ratio, and if it is regulated, how the capital costs are recovered.

19. What is operating cost?

Operating costs include operating and maintenance (O&M) plus fuel, and need to allow for a return on equity.

20. What is meant by depreciation?

The wear and tear of the equipment with use, the corrosion and ageing of metals and the deterioration of insulation with time, will reduce the cost of the equipment

UNIT – III

TWO MARKS

1. State the advantages of electric heating.

- Cleanliness
- Economical
- Uniform heating
- Cheap furnace

2. What are the modes of heat transfer?

- Conduction
- Convection
- Radiation

3. State Stephan's law of radiation

In this process heat is transferred by means of heat waves governed by Stephan's law

4. What are the properties of heating element material?

- High specific resistance ---- free from oxidation
- High melting point -----small temp coefficient

5. Name the method of temp control in resistance oven.

- By varying the no. of elements
- Changing in connection
- External series resistance

- Changing transformer tapings
- Automatic control

6. How electric heating is classified?

- Resistance heating
- **Induction heating**

7. What are the applications of induction heating?

- Surface hardening
- Annealing
- Melting
- Tempering
- Soldering

8. Mention few draw backs of core type furnace.

- Due to poor magnetic coupling , leakage reactance is high and power factor is low
- Low frequency supply is required

9. State the advantage of core less induction furnace

- Time taken to reach the melting temp is less
- There is no smoke and noise

10. What is induction heating?

- Induction heating is a method of providing fast & consistent heating for manufacturing applications which involved bonding or changing properties of metal for electrically conducting materials.
- Today's advanced design concepts warrant most engineering components to be heated to either from different shapes or attain specific grain structures.
- Microtech's range of induction heating systems are offered for custom built applications with suitable coils, materials handling solutions with complete automation

11. What are the classifications of power frequency method?

- Direct resistance heating
- Indirect resistance heating
- Direct arc heating
- Indirect arc heating

12. What is meant by direct resistance heating/

In this method of heating current is passed through the body to be heated. the resistance offered by the body to the flow of current produces ohmic loss which results in heating the body.

13. What is meant by indirect resistance heating/

In this method the current is produced through a high resistance wire known as heating element. the heat produced due to $I^2 \cdot R$ loss in the element is transmitted by radiation or convection to the body to be heated.

14. What is the requirement of a good heating material?

- High specific resistance
- High melting point
- Free from oxidation
- Low temperature coefficient of resistance

15. What are the properties of steel?

- **Strength** - the ability to withstand mechanical stress
- **Ductility** - Ability to be formed without rupture
- **Hardness** - Resistance to deformation, abrasion, cutting, crushing
- **Toughness** - ability to absorb shock without breaking

16. What is annealing in heat treatment?

Annealing consists of heating the steel to or near the critical temperature (Temperature at which crystalline phase change occurs) to make it suitable for fabrication. Annealing is performed to soften steel after cold rolling, before surface coating and rolling, after drawing wired rod or cold drawing seamless tube. Stainless steels and high alloy steels generally require annealing because these steels are more resistant to rolling.

17. What is normalizing?

Normalizing consists of heating the steel above the critical temperature and cooling in air. This treatment refines the grain size and improves the uniformity of microstructure and properties of hot rolled steel. Normalizing is used in some plate mills, in the production of large forgings such as railroad wheels and axles, some bar products.

18. What is quenching?

Quenching consists of heating the steel above the critical point and holding at that temperature for enough time to change the crystalline structure. This heat is followed by quenching in a water or oil bath to bring the steel back through the critical temperature range without further changes to the microstructure. Quenching produces very hard, very brittle steel.

19. What is tempering?

Tempering is carried out by preheating previously quenched or normalized steel to a temperature below the critical range, holding, and then cooling to obtain the desired mechanical properties. Tempering is used to reduce the brittleness of quenched steel. Many products that require hardness and resistance to breakage are quenched and tempered.

20. What is dielectric heating?

The process of heating poor conductors of electricity (dielectrics) by- means of high-frequency electrical currents. The thermoplastic composite to be heated forms the dielectric of a condenser to which is applied a high-frequency (20-to-80 mc) voltage. The heat is developed within the material rather than being brought to it from the outside, and hence the material is heated more uniformly throughout.

UNIT-IV

TWO MARKS

1. What are the applications of dc series motor?

- The series DC motor is an industry workhorse for high and low power, fixed and variable speed electric drives. Applications range from cheap toys to automotive applications.
- They are inexpensive to manufacture and are used in variable speed household appliances such as sewing machines and power tools.
- Its high starting torque makes it particularly suitable for a wide range of traction applications.

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10. What is induction heating?

Induction heating is a method of providing fast & consistent heating for manufacturing applications which involved bonding or changing properties of metal for electrically conducting materials.

11. What is plane angle?

A plane angle is subtended at a point and is enclosed by two straight lines lying in the same plane. A plane angle is expressed in terms of degrees or radian. A radian is the angle subtended by an arc of a circle whose length equals the radius of the circle.

12. Define illumination.

Illuminance is the total [luminous flux](#) incident on a surface, per unit [area](#). It is a measure of the intensity of the incident [light](#), wavelength-weighted by the [luminosity function](#) to correlate with human brightness perception. Similarly, luminous emittance is the luminous flux per unit area emitted from a surface. Luminous emittance is also known as luminous exitance

13. What are the several strategies available to minimize energy requirements in any building?

- Specification of [illumination](#) requirements for each given use area. Analysis of lighting quality to insure that adverse components of lighting (for example, glare or incorrect [color spectrum](#)) are not biasing the design.
- Integration of space planning and interior architecture (including choice of interior surfaces and room geometries) to lighting design.
- Design of time of day use that does not expend unnecessary energy. Selection of [fixture](#) and lamp types that reflect best available technology for [energy conservation](#).
- Training of building occupants to utilize lighting equipment in most efficient manner.

14. State illumination law.

Frechner's Law states that the same percentage change in stimulus calculated from the least amount perceptible gives the same change in sensation. Inverse Square Law states that the intensity of **illumination** produced by a point source varies inversely as square of the distance from the source.

15. Define solid angle.

A concept which frequently is used for illumination calculation is the solid angle.

Solid angle subtended by area = area of inter section at sphere surface / (radius of sphere)²

16. Define luminous flux.

It is the rate of energy radiation in the form of light waves and is denoted by $\Phi = Q / t$. where Q is the radiant energy. Its unit is lumen.

17. Define lumen.

One lumen is defined as the luminous flux emitted by a source of one candle power in a solid angle.

$$\text{Lumen} = \text{candle power of source} * \text{solid angle}$$

18. Define candle power.

It is defined as the no. of lumens emitted by that source per unit solid angle in a given direction. The term candle power is used interchangeably with intensity.

19. What are the classifications of lighting?

- Lighting is classified by intended use as general, localized, or task lighting, depending largely on the distribution of the light produced by the fixture.
- Task lighting Is mainly functional and is usually the most concentrated, for purposes such as reading or inspection of materials. For example, reading poor-quality reproductions may require task lighting levels up to 1500 lux (150 footcandles), and some inspection tasks or surgical procedures require even higher levels.
- Accent lighting is mainly decorative, intended to highlight pictures, plants, or other elements of interior design or landscaping.
- General lighting fills in between the two and is intended for general illumination of an area. Indoors, this would be a basic lamp on a table or floor, or a fixture on the ceiling. Outdoors, general lighting for a parking lot may be as low as 10-20 lux (1-2 footcandles) since pedestrians and motorists already used to the dark will need little light for crossing the area.

20. What are the several factor caused by Over-illumination

- Not using timers, occupancy sensors or other controls to extinguish lighting when not needed
- Improper design, especially of workplace spaces, by specifying higher levels of light than needed for a given task
- Incorrect choice of fixtures or light bulbs, which do not direct light into areas as needed
- Improper selection of hardware to utilize more energy than needed to accomplish the lighting task

UNIT – V

TWO MARKS

1. Classify an electric drive.

- Group drive
- Individual drive
- Multi motor drive

2. What are the factors affecting selection of motor?

- Electrical characteristics
- Size of motor
- Mechanical factors
- Cost

3. What are the factors to be considered in size of motor?

- Continuous rating
- Variable load rating
- Over load capacity
- Pull out torque

4. What are the mechanical factors?

- Type of enclosure
- Bearings
- Transmission of drive
- Noise level

5. Write the nature of mechanical load.

- Constant load torque
- Load torque \propto speed
- Load torque \propto speed 2
- Load torque \propto 1/speed

6. Classify the load torque depending upon the time.

- Continuous and constant load
- Continuous but variable loads
- Pulsating loads
- Impact loads
- Short time intermittent

7. What are the essential requirements of a satisfactory braking?

- It should be fast, reliable and controllable
- The stored energy of rotating parts should be dissipated through suitable means.
- A failure of any part of the braking system should result in braking only.

8. What are the three methods of electrical braking?

- Plugging or counter current braking
- Rheostatic braking
- Regenerative braking

9. What is mechanical or friction braking?

It is the braking in which the stored energy of the rotating parts is dissipated as heat by a brake shoe or band rubbing on a wheel or brake drum.

10. State the working of dynamic or rheostatic braking.

In this method the motor is disconnected from the supply and is used as a generator, driven by the momentum of the equipment to be broken, the electric energy so generated is dissipated as in external resistors. This method can be used for dc, induction and synchronous motors.

11. State the two advantages of electric drive.

- Electric drives are adaptable to any type of load requirement

- There is a wider variety of electric motors, which can be designed exactly according to load requirements.

12. What is an individual drive?

A single electric motor is used to drive one individual machine though its cost is more than group drive but each operator has complete control of his machine which will enable.

13. Define continuous rating of motor.

It is that output which a motor can give continuously for long time without exceeding the given temperature rise and motor should be 20% overload for 2 hours.

14. Write the torque equation of a dc motor.

Equation: $T = FR$

Where: T = Torque, lb-ft

F = Force, lb

R = Radius, or distance which force is applied from pivot location, ft

15. Write the formula to determine a fan or blowers horsepower.

Equation: Where T = Required Torque, lb-ft

$$T = \frac{(WK^2) \Delta N}{308t}$$

WK^2 = Inertia of load to be accelerated
rpm

t = Time to accelerate the load, seconds

ΔN = Change of speed,

16. What are the four important functions in a hybrid vehicle application?

- It enables the "start-stop" function, turning off the engine when the vehicle is stationary saving fuel.
- It generates the electrical energy to power all the electrical ancillaries.
- It provides a power boost to assist the engine when required, permitting smaller engines for similar performance.
- In some configurations it recuperates energy from regenerative braking.

17. What is reluctance torque?

Torque is created due to the reaction between magnetic fields. Consider a small bar magnet in the field of another larger magnet such as the gap between the poles of a horse shoe magnet or one of the pole pairs of an electric motor. When the bar magnet is aligned with the poles of the large magnet its field will be in line with the external field. This is an equilibrium position and the bar will not experience any force to move it. However if the bar is misaligned with the poles, either rotated or displaced, it will experience a force pulling it back into line with the external field. In the case of a lateral displacement, the force diminishes as the distance increases, but in the case of a rotation, the force will increase reaching a maximum when the bar is at

right angles to the external field. In other words the torque on the magnet is at a maximum when the fields are orthogonal and zero when the field are aligned.

18. Define torque angle.

Even in synchronous motors in which the rotor turns at the same speed as the flux wave, because of the losses noted above the rotor poles will never reach complete alignment with the peaks in the flux wave, and there will still be a displacement between the rotating flux wave and the rotating field. Otherwise there would be no torque. This displacement is called the "torque angle". The motor torque is zero when the torque angle is zero and is at its maximum when the torque angle is 90 degrees. If the torque angle exceeds 90 degrees the rotor will pull out of synchronism and stop.

19. Write the characteristics of motor.

Torque **generally speaking the torque produced by a motor is proportional to the current it consumes and also proportional to the flux in the air gap.**

$$T = K_1 I B$$

Speed

- In DC motors the rotational speed is proportional to the applied voltage. The speed is however inversely proportional to the flux in the air gap.

$$K_2 \frac{V}{B}$$

In AC motors the speed is proportional to the frequency of the applied voltage and inversely proportional to the number of magnetic poles.

$$N = K_3 \frac{f}{P}$$

20. What is cogging?

Cogging is the jerky, non uniform angular velocity of a machine rotor particularly apparent at low speeds in motors with a small number of poles. It occurs because the rotor tends to speed up as it approaches the stator poles and to slow down as it leaves the poles. It is also noticeable when pulsed DC is used if the frequency of the supply waveform is too low. The problem can be reduced by using skewed rotor windings as well as increasing the number of poles in the motor.
