

UNIT – INTRODUCTION

PART-A

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 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
- The event of power failure at one station the supply can be fed from other station
- Reduction 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 characterizing 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 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
- Deraiz turbine, patented by Deraiz 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.

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 a ternate air and gas passages. This is not used extensively s it involves high maintenance.

20. Define Economizer:

The economizer is 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.

PART-B

1. Draw a layout for a thermal plant and explain the functions of each components of that plant.
2. What is meant by chain reaction in nuclear power plant Also explain the process of nuclear fusion?
3. (a) Mention the advantages and Disadvantages of hydro-power plant
(b) Explain the functions of the following 1.Reservoir, 2.Dam, 3.Spill ways, 4. Intake, 5. Fore bay, 6. Penstock, 7.Surge tank.
4. What are pumped storage plants? Describe with need sketch the principle of operation of such a plant Also discuss the role of this plant in a large inter-connected power system?
5. Describe with neat sketch the construction and principle of operation of an electro static precipitator. Discuss its advantage over mechanical ash separators.
6. Write short notes on 1. Condensers, 2. Economizers. 3. Air pre heaters 4. Super heater. 5. feed water system. 6. Cooling tower.
- 7.(i) State electrical systems and sub stems Used in aircraft and its requirements.
(ii)Describe the construction of prime move for aircraft generator
8. Explain the working of a gas turbine power plant with a schematic diagram.
9. Draw block diagram of a diesel power station and discuss its operation.
10. What is a need for distributed generating system?

UNIT – I ECONOMIC ASPECTS OF POWER GENERATION

PART A

1. Define demand factor.

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

Demand factor = maximum demand / connected load

2. Define load factor

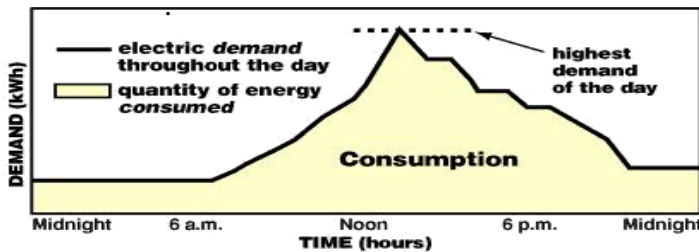
It is the ratio of average load to the maximum demand during a given period

Load factor = average load / 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, com 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 charged on the basis of maximum demand on the consumer and the units consumed, and then it is called two part tariff.

8. What is energy efficient drive?

The concept of energy efficient design has developed 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 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 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 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 mandatory 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 loss and 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

PART-B

1. What is cost of electrical generation? What are the various types of cost associated with power generation?

2. The monthly reading of a consumer meter are as follows Maximum demand = 150kW, Energy consumed 1×10^5 units, Reactive energy = 75MVARhr, If the tariff is Rs 50 per KW per month of maximum demand + 15 Paise per unit + Rs 3 per KW for each 0.1 P.F below 0.8, calculate the monthly bill of the consumer.

3. What is a tariff? Discuss and compare various tariffs used in practice.

4. (a) Explain the term depreciation and discuss various methods of calculating the depreciation of an electrical plant.

(b) What are load curves and load duration curves? Discuss their utility in the economics of generation.

5. A generating station has a maximum demand (MD) of 15 MW and the daily load curve on the station is as follows, 10pm to 05 am 2500 KW, 05am to 07 am 3000KW, 07pm to 11am 9000KW, 11am to 1pm 6000KW, 1pm to 4pm 10000KW, 4pm to 6pm 12000KW, 6 pm to 8pm 15000KW, 8pm to 10pm 5000KW

Determine the size and the number of generator units, plant load factor, plant capacity factor, use factor and reserve capacity of plant.

6. a). What is the need for power factor correction?

(b). A 3phase synchronous motor is connected in parallel with a load of 500 KW, 0.8p.f lagging and its excitation is adjusted until it raises the total P.F to 0.9 lagging. If the mechanical load on the motor including loss takes 125KW, calculate the KVA input to the motor. Draw phasor diagram for condition.

7. i) What are the disadvantages of low power factor? How to avoid it?

ii) What are the measures related to power quality?

UNIT – ILLUMINATION

PART-A

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 tapping's
- 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 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.

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.

16. 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.

17. 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.

18. 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.

PART-B

1. (a) Explain the method of working of a Neon lamp with a neat sketch.
(b) State the Lambert's cosine law of illumination.
2. Estimate the number and wattage of lamps which would be required to illuminate a shop space 60 X 15metres, by means of lamps mounted 5metres above the working plane. The average illumination required is about 100 Flux, Co-efficient of utilization = 0.4, luminous efficiency is 16 lumens per Watt. Assume a space height ratio of unity candle power depreciation of 20%.
3. (a) Two lamps one 200cp and another 500cp are hung at a height of 10metres and 25metres respectively. The horizontal distance between the poles is 80metres. Determine the illumination at the midpoint between the poles on the ground. (10) (b) What are the requirements of good heating materials?
4. (a). Explain the working of a sodium vapour lamp with a neat sketch.
(b). what is Halogen lamp?

5. Explain the operation principle and working of a mercury vapour lamp and compare its performance with a fluorescent lamp. Describe with a neat sketch the principle of operation of a fluorescent lamp. Mention the function of each component.
6. Explain the types of lamps and lighting fittings you should select for (i) A large machine shop with rows of drilling machines (ii) A drawing office and lathes.
7. (a) A 100 candle power lamp is hung 2m above the centre of a circular area of 3 diameters. Determine the illumination at (i) the centre of the area, (ii) a point on the circumference of the area, (iii) average illumination. Find also the average illumination, if a reflector of 50% efficiency is used.
- (b) A lamp of 300 candle power. is placed 1.5 m below a reflecting plane mirror surface, which reflects 70% of the light falling on it. Find the illumination at a point 4m.
8. (a) Explain the principle of street lighting? Show different types of lighting with neat sketches.
- (b) Discuss about Diffusion principle of street lighting.
9. (a) Explain the basic principle of electrolytic process and discuss briefly some of its applications.
- (b) Define and explain “Current efficiency”, “Voltage required” and “Energy efficiency”
When referred to electrolytic processes.
10. Explain electrodepositing processes and discuss clearly various factors governing the Electrodepositing processes.

UNIT-IV INDUSTRIAL HEATING AND WELDING

PART-A

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

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 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 is the luminous flux per unit area emitted from known as luminous existence.

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 or architecture (including choice of interior surfaces and room geometries) to lighting design.
- Design of time of day use that does not expended unnecessary energy.

14. State illumination law

Frechner's Law states that the same percentage change stimulus calculated from the least amount perceptible gives the same change sensation. Inverse Square Law states that the intensity of illumination produced by 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. Lumen = candle power of source * 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 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 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

PART-B

1. Describe two ways how glare is produced and suggest how it can be avoided?
2. What are the advantages and disadvantages of shadows and how hardness of shadow is decreased?
3. What are the main faults of a lighting system and how these are overcome?
4. Why tungsten is selected as the filament material and on what factors its life depends?
5. Compare fluorescent and filament lamps on basis of quality of light, capital and running cost?
6. What is photometry? Describe photovoltaic method of photometry.
7. What are the requirements of good lighting? Explain in detail.
8. A lamp with mean spherical candle power of 1000 is suspended at a height of 1.2 meters, Determine (a) The total flux emitted by the lamp, (b) the illumination just below the lamp.
9. A 60w lamp is placed inside a globe of a diameter 25 cm. it has uniform brightness of 210 milliamberts in all directions. Calculate CP of the globe and estimate percentage of light absorbed by the globe if 60W bulbs emit 730 lumens.
10. A lamp of 1000 cp is hung 10m over the centre of floor of hall 15m square. Find the illumination at the point immediately below lamp and at corners, neglecting the reflections from walls and ceiling.

UNIT – V ELECTRICAL TRACTION

PART-A

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

3. What are the mechanical factors?

- Type of enclosure Bearings
- Transmission of drive Noise level

4. Write the nature of mechanical load.

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

5. Classify the load torque depending upon the time.

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

6. What are the essential requirements of 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 braking only.

7. What are the three methods of electrical braking?

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

8. 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.

9. 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.

10. 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.

11. 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.

12. 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 hrs.

PART-B

1. (a) Sketch the typical speed-time curve for (1) Main line service and to sub – urban services in electric traction.
(b) Explain the mechanics of train movement?
2. (a) What is multiple unit control in electric train and explain in details each one of them?
(b) What are different braking systems and explain them in details?
3. (a) What is the speed controls of different system of motors used in electric train?
(b) Define co-efficient of adhesion “and explain the factors on which it depends?
4. (a). Discuss the various arrangement of current collection used in electric traction.
(b). Write short notes on the recent trends in electric traction.
5. Two stations A & B are 12Km apart and average speed of the train is 60Kmph. The acceleration is 5Kmph, retardation during coasting is 0.3kmph and braking is 5Kmph respectively. Taking quadrilateral approximation of speed, time curve, determine the duration of acceleration, coasting and braking periods and distance covered during these periods.
6. State the principle of regenerative braking. Explain regenerative braking in respect of
a) DC motors, b) Induction motors.
7. (a) what are the various methods of speed control of series motors and their scope of speed range?
(b) Discuss the merits and demerits of the induction motor for traction duties?
8. (a) What is the main advantage of series parallel control of motors over rheostat method of starting and speed control?
(b) What is multiple unit control and for what application will you suggest this?