UNIT-I

ELECTRIC DRIVES AND TRACTION

1.What are requirements the of ideal traction system?

- The speed control of the traction motor should be easy.
- It must be free from smoke, ash, dust, etc..
- Locomotive should be self contained and it must be capable of withstanding overloads.

2.Define average speed and scheduled speed?

Average speed: The mean of the speed from start to stop (i.e) the distance covered between two stops divided by the actual time of run is known as "average speed".

Average speed=distance between stops/actual time of run in T.

Scheduled speed: The ratio of distance covered between two stops and total time of run including time of stop is known as "scheduled speed".

Scheduled speed=distance between stops/actual time of run + stop time.

3. Suggest suitable drives for lifts &cranes.

LIFTS**:** DC series motor.

CRANES: DC series and shunt.

4.What are the merits &demerits of DC system of track electrification?

Merits:

High starting torque, Less maintenance cost, Less vibration,Cheapest method of traction.

Demerits:

- High capital cost.
- Problem of supply failure.
- Additional equipment is required for achieving electric braking &control.

5. What are the factors governing scheduled speed of a train?

The scheduled speed of a given train when running on a given service is affected by the following factors.

- Acceleration and braking retardation.
- Maximum or crest speed and
- Duration of stop.

6. What are the recent trends in electric traction?

Development of practical electric vehicles has been completed. Motor selection becomes clear,battery trend becomes also clear, components are almost complicated.

7. Define tractive effort &its formula.

It is an effective force on the wheel of a locomotive which is required for its propulsion. The tractive effort is a vector quantity and it is tangential to wheel. It is measured in newton.

$$Ft=Fa+ Fg+ Fr$$

8. Define crest speed.

The maximum speed attained by the vehicle during the run is known as' CREST SPEED".

9. Define specific energy consumption & discuss the factors that affects the specific energy consumption of trains operation at a given schedule speed.

It is the energy consumed per tonne mass of train perkm length of the run.the specific energy consumption of a train running at a given schedule speed is influenced by

- Distance between stops
- Acceleration
- Retardation
- Maximum speed
- Type of train and equipment
- Track configuration.

10. What are the features of electric traction?

- High starting torque.
- Simple speed control
- Self relieving property
- Overload capacity
- Parallel running.

11. Define dead weight adhesive weight.

Dead weight: The total weight of locomotive and train to be pulled by the locomotive is known as dead weight.

Adhesive weight: The total weight to be carried on the driving wheels it is known as adhesive weight.

12.Name the advanced methods of speed control of traction motor.

- Tap changer control
- Thyristor control
- Chopper control
- Microprocessor control.

PART-B

1.Explain the mechanism of train movement with the speed time curve.

2.Explain about the types of supply system used in traction system.

3.Explain about multi motor speed control

4. What are the various types of electric braking used in traction?

5.Sketch the typical speed time curve for main line service &sub urban service in electric traction. Find the equation of distance travelled for main line system.

6.Explain the requirements of electric traction system.

7.What are the factors influencing choice of electric drives

8.Explain generative braking when used for DC series traction motor.How does it differ from the regenerative braking as used for shunt motors.

9.A 250 tonnes train with 10% rotational inertia effect is started with uniform acceleration &reaches a speed of 50 km p.h.p.s in 265 sec on a level road. find the specific energy consumption if the journey is to be made according to simplified trapezoidal speed time curve,the acceleration is 2 km p.h.p.s. Tracking retardation 3km./hr/sec & distance between the station is 2.4 km .efficiency of motor =0.9,track resistance=5 kg/tonne.

10.A train runs with an average speed of 50kmph.Distance between stations is 2.5 km.values of acceleration & retardation are 1.8 km phps &2.4 km phps respectively.calculate the maximum speed of the train assuming speed-time cuve.

12.An electric train has an average speed of 42 kmph on a level track between stops 1400 m apart.It is accelerated at 1.7 kmphps &is braked at 3.3 kmphps. Draw the speed time curve of the run.

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UNIT-II

ILLUMINATION

2-MARKS:

1.Define utilization factor.

It is defined as the ratio of total lumens reaching the working plane to total lumens given out by lamp.

Utilization factor=Total lumens reaching the plane/Total lumens given out by the lamp.

2.What is flood lightning where it is generally used?

Flood lightning means flooding of large surface with light from powerful projectors. A special reflector and housing is employed in flood lightning in order to concentrate the light emitted from the lamp in to a relatively narrow beam known as flood lightning projectors.

It is generally used in,

- Aesthetic flood lightning
- Industrial &commercial flood lightning
- Advertisting.

3.Define lumen.

Lumen is the unit of flux and is defined as the luminous flux per unit angle from a source .

4.Define luminous efficiency.

The ratio of the total luminous flux to the total radiant flux of an emitting source.

5.List the type of lightning system.

Incandescent ,tungsten-halogen, compact fluorescent lamps, tubular fluorescent fixtures, high intensity discharge.

6 .Define the MSCP and lamp efficiency.

MSCP: It is defined as the mean of candle powers in all directions and in all planes from the source of light.

LAMP EFFICIENCY: It is defined as the ratio of the luminous flux to the power input .It is expressed in lumens per unit.

7.Define the term luminous flux.

It is defined as the total quantity of light energy emitted per second from a luminous body. It is represented by symbol "F" or "Q" and is measured in lumens .It helps us to identify the output and efficiency of a given light source.

Flux=Q/t

Q=light quantity

8. List the types of lamps.

Sodium vapour lamps

Fluorescent lamp

Neon lamp

Mercury vapour lamp.

9. Why tungsten is used as filament material.

Pure tungsten has properties including the highest melting point(3695 k),lowest vapour pressure and greatest tensile strength out of all the metals.

10. What is the importance of street lightning system ?

To reduce the occurrence of accident.

To avoid the theft.

11. Define solid angle.

Solid angle is the angle generated by the surface passing through the point in space & the periphery of the area .

W=area/radius=a/$\mathbf{r^2}$

12.What are the requirements of lightning system .

The following factors must be considered while designing lightning scheme.

Illumination level

Uniform of illumination level

Colour of light

Shadows

Glare.

12.Distinguish between direct lightning & indirect lightning

DIRECT LIGHTNING	**INDIRECT LIGHTNING**
Light output of the lamp towards downward.	Towards upward
It suffers from hard shadows & glare.	Glare is reduced to minimum.

13.If the total lumens required are 7200 & coefficient of utilization is 0.3, calculate lamp lumens required.

Utilization factor= total lumens reaching the working plane

Total lumens given out by the lamp.

0.3=7200/total lumens

Total lumens=7200/0.3=24000

PART –B

1. Discuss laws of illumination & its limitations.

2. Explain the working of high pressure mercury vapour lamp with neat sketch .

3.Explain the various factors to be taken in to account for designing scheme for

1.street lightning

2.flood lightning

3.high way lightning

4.With a neat diagram explain the construction & working of

(a) sodium vapour lamp

(b)CFL

5.A hall of 30m long and 12 m wide is to be illuminated and the illumination require is 50 lumens per m^2 .calculate the no. of fitting required taking depreciation factors of 1.3 and utilization factor of 0.5 given that the output of different types of lamp or given below.

Watts	100	200	300	400	500
Lumens	1615	3650	4700	9950	21500

6.A lamp of 300 c.p is placed in 1.5 m below a reflecting plane mirror surface which reflects 70% of the light falling on it ,find the illumination at point 4m away from the foot of lamp hung 6m above the ground.

7.Explain the various steps followed in the calculation of illumination for designing the residential lightning.

UNIT –III

HEATING AND WELDING

PART-A

1.List the advantage of electric heating?

Economical, cleanliness, Absence of flue gases , ease of control or adaptation, Automatic protection ,upper limit of temperature special heating features ,High efficiency of utilization better working conditions ,safety ,heating of non conducting material.

2.What is meant by electric are welding ?what are the different types of electrode used and its applicability?

Are welding is a type of welding that uses a power supply to create an electric arc between an electrode and base material to melt the metals of the welding point .they can use either direct or alternating current ,and consumable or non consumable electrodes. Purpose is to join two metals .fabrication building and riveting.

3.What are the applications of induction heating?

Surface hardening

Annealing

Tempering

Deep hardening

Soldering

Melting of metals

Extraction of metal from ore.

4.What the requirements of good heating materials?

High specific resistance

High melting point

Free from oxidation

Low temperature coefficient of resistance.

5.Comparison between DC welding &AC welding.

PARTICULARS	DC WELDING	AC WELDING
Prime cost	Two to three times that are compared to that of transformer.	Comparatively low.
No load voltage	Low(safe)	Frequency two high.
Heating	Uniform	Not so uniform as in case of DC
Power factors	Higher	low

6.Mention the merits of dielectric heating.

Uniform generation of heat with in the dielectric medium

Inflammable materials such as plastics wood etc.

It is the only method of heating non conducting material

Heating is very fast

7.Specify the desirable properties of heating element materials.

Composition

Maximum operating temperature

Specific resistance at 20 degree Celsius

Specific gravity.

8.Mention the factors which limits of choice of frequency in induction & dielectric heating?

Induction heating:

Thickness of the surface to be heated

Time of continuous heating

Temperature

Dielectric heating:

Thickness

Potential gradient

Breakdown voltage

Insulation

9.What is meant by arc welding & list its types?

Arc welding is a type of welding that uses a power supply to create an electric arc between an electrode and the base material to melt the metals at welding point .

Types :

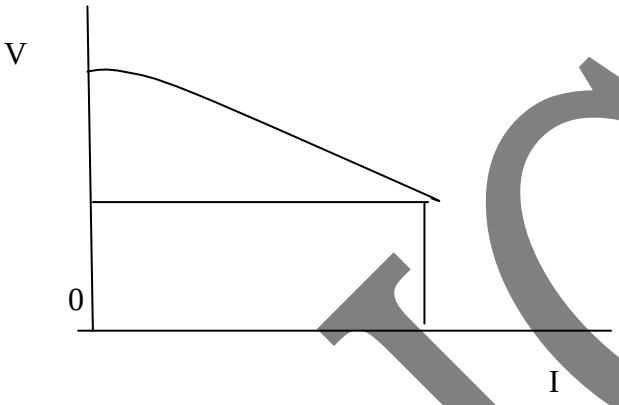
Flux cored arc welding

Gas metal arc welding

Shielded metal arc welding

Submerged arc welding.

10.Draw the VI characteristics of welding transformer.



11.Mention the application of dielectric heating ?

Plastic welding ,plastic preheating, textile drying ,wood glue drying ,food drying ,post fake moisture removal ,pasteurization ,sterilization and preheating.

12.What is meant by resistance heating?

The resistance heating is based on the principle that a current passing through a conductor produces heat due to I2R losses. The maximum temperature that can be achieved is 1000^0 c .this method is used for drying and barking, heat treatment of metals ete.

13.List some steps taken to minimize skin effect in induction heating?

By using copper clad steel wire

By using low frequency

By reducing the the thickness of the laminate or strips.

PART-B

1.Explain the classification of electric heating and its advantage.

2.What is electric welding ?explain its types.

3.Describe the construction & operation of coreless induction furnaces.

4. Explain the process of dielectric heating & desire the expression for total heat enegy.

5.Discuss in details about any two types of resistance welding

6. With neat diagram explain the working of different types of arc welding.

7.With the neat sketches ,explain the functioning of carbon are welding & shielded metal arc welding .

8.Explain the characteristics of a welding generator.

9.Estimate the efficiency of a high frequency induction furnace which takes 10 minutes to melt 1.8 kg of aluminium .the input to the furnace being 5kw & initial temperature 15^0c

10.What is the different od AC welding & DC welding.

11. What are the requirements of good welding.

UNIT-IV

SOLAR RADIATION AND SOLAR ENERGY COLLECTIONS

PART- A

1.Write down the energy balance equation for solar collector.

The energy balance equation for the whole solar collector can be written as,

$$Ac[\{HR(\alpha.\tau)_Q + HR(\tau.\alpha)\alpha\}] = 2u + Ql + Qs$$

Where,Qu= rate of useful heat transfer to a working fluidn in the solar heat exchanger.

Ql=rate of energy loss

Qs= rate of energy storage in collector.

2.Define solar constant.

The solar constant Isc is the rate at which energy is received from the sun on a unit perpendicular to the rays of the sun ,at the mean distance of the earth from the sun, based on

3.Define collector efficiency.

Collector efficiency (ηc) is the collector performance and is defined as the ratio of the useful gain over any time period to the incident solar energy over the same time period

4.Give the main components of flat plat collector.

Five main components as follows:

A transparent cover.

Tubes fins passages or channels

Absorber plate

Insulation

Casing or container.

5.State wien's law.

Wien 's law state that the emission increases with temperature .the re emmited light if so progressively shorter wavelength and greater energy as the temperature of block body increases . this is expressed by wein's law which can be written as

$\lambda max.T=constant=2989$ um.kelvin

6.List the advantage of flat plat collectors.

They have the advantage of using both beam & diffuse solar radiation.

They do not require orientation towards the sun

They require little maintenance.

7.Define air mass.

Air mass is often used as a measure of the distance travelled by beam radiation through the atmosphere before it reaches a location on the earth surface .It is defined as the ratio of the mass of the atmosphere through which the beam radiation passes to the mass it would pass through if the sun directly over head.

8.What are the different types of solar collector.

Solar collector are classified into two types.

They are.

Non concentrating or flat plat type solar collector

Concentrating type solar collector.

9.What are the methods to improve the efficiency of flat plat collector.

The transmission efficiency of energy through the collector to the working fluid may be increased.Decreasing the thermal losses from collector to ambient by reducing conductive

10.What are the different types of heat transfer mechanism.

Radiation

Conduction

Convection.

PART-B

1.Explain the power extraction aspects ofsolar PV system.

2.Explain the working principles of various types of concentrating solar collector with neat sketch .

3.Describe the operation & control stratergy of solar power conversion system

4.Schematically describe the residential coding & heating with solar energy.

5.Describe flat plate collector

6.Draw the neat block diagram of standalone solar PV generation system. Also explain the role of individual blocks

7.What the basic components of solar PV system

8.Explain the basic solar PV system used for power generation with neat diagram.

9.Describe briefly grid interactive solar PV system.

10.Explain how a solar used for industrial heating system.

11.Explain various solar PV application.

12.What is the importance of MPPT in solar PV system.

13.Explain the various stratergies used for operation of an MPPT?

14.Explain the VI characteristics of a solar cell &also explain an equvalient circuit of particular solar PV cell?

UNIT-V

WIND ENERGY

PART-A

1.List the types of wind turbine.

There are two types of wind turbine

Horizontal axis machines.

Vertical axis machines.

Horizontal axis machines are classified into

Horizontal axis using two aerodynamic blades

Horizontal axis propeller type using single blade.

Horizontal axis multibladed type.

Horizontal axis windmill dutch type.

Sail type.

Vertical axis wind turbine are classified into

Savonious rotor type machine

Darrieus type machines.

2.What are the factor determine the output from wind energy converter.

The wind speed

The cross section of wind swept by rotor

The overall conversion efficiency of the rotor transmission system.

3.Give the expression for available wind power.

$P= 1/8\rho\pi D^2V^3$(watts)

Where,

P=density of air

D=circular diameter

V=velocity of air.

4.Give some important factor consider for site selection of WECS.

High average annual wind power

Availability of anemometry data

Altitude of proposed site

Terrain and its aerodynamics.

Local ecology

Nearness of site to local centre.

5.Define power co-efficient.

The fraction of the free flow wind power that can be extracted by a rotor is called power coefficient.

Power coefficient= power of wind rotor/power available in the wind

The maximum theoretical value of power coefficient is equal to 16/27 (or) 0.593

6.Define solidity.

Solidity is normally defined as the fraction of the total circumferential that contains blades.Numerically it can be expressed as

$S= NC/\pi D$

Where, N= No of blades.

C= Average breadth.

7.Define magnus effect.

Magnus effect is caused by spinning a cylinder in an air stream at high speed of rotation. The spinning slows down the air speed on the side where the cylinder is moving into wind and increases it on the other side the result is similar to an air foil.This principle has been put to practical use in one (or) two cases but is not generally employed.

8.What is the function of back up in small producers?

Battery storage

Connection with the local electricity distribution system.

A standby generator powered by liquid fuels.

9.What are the conversion losses available wind energy system?

A 100% efficient aero generator would able to convert upto a maximum 60% of the available energy in wind to mechanical energy.Well designed blades will typically extract 70% of the theoretical maximum but losses incurred in the gearbox,transmission system or pump could decreases overall wind turbine efficiency to 35% or less.

10.Give some environmental effect due to wind turbine.

Electromagnetic interference

Noise

Visual effect

Bird life

Risk

PART-B

1.Sketch the diagram of HAWT explain the function of its main components.

2.Discuss the relative performance of a pitch regulated and stall regulated wind turbine.

3.Evaluate the suitability of various types of generator for wind power generation.

4.Explain the main features of wind diesel hybrid generating system also point out various types of operating scheduling for diesel unit.

5.With the help of block diagram functions of WECS.

6.Derive the expression for maximum axial thrust experienced by a wind turbine and also find the condition for such operation.

7.Using Betz model of a wind turbine describe the expression for power extracted from the wind.What is the maximum theoretical power that can be extracted and what condition.

8.Sketch the diagram of VAWT describe the functions its main components.

UNIT-V

WIND ENERGY

PART-A

1.list the types of wind turbines

There are two broad classification of WECS, they are

- **Horizontal axis machines**
- **Vertical axis machines.**

Horizontal axial machines are classified into

i)horizontal axis using two aerodynamic blades

ii)horizontal axis propeller type using single blade

iii)horizontal axis multi bladed type

iv)horizontal axis wind mill dutch type

v)sail type

vertical axis wind turbines

i)savonious rotor type machines

ii)derrieus type machines.

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- The wind speed
- The cross section of wind swept by rotor and
- The over all conversion efficiency of the rotor transmission system

3.give the expression for available wind power.

$$P=\frac{1}{8}\rho\pi D^2V^3$$

Where,P=density of air

D=circular diameter

V=velocity of air.

4.give some importance factors consider for **site selection of WECS.**

- High annual average wind power
- Availability of anemometry data
- Altitude of the proposed site.
- Terrain and its aerodynamics.
- Local ecology and
- Nearness of site to local centre/users.

5.Define power co-efficient.

The fraction of the free flow wind power that can be extracted by a rotor is called the power coefficient.Thus,

$$\text{Power coefficient} = \frac{\text{Power of wind rotor}}{\text{Power available in the wind}}$$

The maximum theoretical value of power co-efficient is equal to 16/27 (or) 0.593

6.Define solidity

Solidity is normally defined as the fraction of the total circumferential that contains blades.Numerically it can be expressed as

$$S= NC/\pi D$$

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Magnus effect caused by spinning a cylinder in an air stream at high speed of rotation,The spinning slows down the air speed on the side where the cylinder is moving into wind and increases it on the other side,the result is similar to an air foil.This principle has been put to practical use in one (or) two cases but is not generally employed.

8.What is the function of back up in small producers?

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- Connection with the local electricity distribution system.
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A 100% efficient aerogenerator would able to convert upto a maximum 60% of the available energy in wind into mechanical energy. Well degined blades will typically extract 70% of the theoretical maximum,but losses incurred in the gearbox,transmission system (or) pump could decreases overall wind turbine efficiency to 35% (or) less.

10.Give some environmental effects due to wind turbine.

- Electromagnetic interference.
- Noise
- Visual effects.
- Bird life.
- Risk.

PART-B

1.Sketch the diagram of a HWAT,explain the function of its main components.

2Discuss the relative performance of a pitch regulated and stall regulated wind turbine.

3.Evaluate the suitability of various types of generators for wind power generation.

4.Explain the main features of wind diesel hybrid generating system.Also point out various types of operational scheduling for diesel unit.

5,With the help of block diagram,explain the functions of WECS.

6.Derive the expression for maximum axial thrust experienced by a unit turbine and also find the condition for such operation.

7.Using betz model of a wind turbine describe the expression for power extracted from wind.What is the maximum theoretical power that can be extracted and what condition.

8.Sketch the diagram of VAWT,describe the functions its main components.

9.Demonstrate upwind and downwind machines,yaw active and yaw fixed machines.

10.With the help of a diagram,explain the nature of variation of wind speed with height from the ground.Explain the terms: Wind shear,gradient height,free atmosphere,planetary boundary,surface layer and edman layer.