BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

UNIT WISE TWO MARKS QUESTIONS

UNIT-I ELECTRICAL CIRCUITS AND MEASUREMENTS

1.Define electric current.

Electric current is defined as rate of flow of electric charge

$i = \frac{dq}{dt} Amperes$

The unit of current is Amperes

2.Define electrical potential

This is generally measured between two points and its unit is volts. If the work done in moving a charge of 1 coulomb between any two points is one joule ,then we say that the potential of one point with reference to the second point is one volt.

$E = \frac{dW}{dQ}$volt

3.What is meant by resistance?

Resistance is the property by which it opposes the flow of current .The unit of resistance is Ohms.

4.State Ohms law.

When the temperature remains constant current flowing through a circuit is directly proportional to potential difference across the conductor $E \propto I$

$E = IR$

5.What is meant by electric energy?

Energy is the total amount of work done and hence is the product of power and time.$W = EIt\ joules$

6.What is meant by electrical power ?

The rate at which work is done is called power. Its unit is joules per second or watt

Power in electric circuits is obtained as a product of voltage and current .$P = EI\ watts$

7.State Kirchhoff's law.

Kirchhoff's current law

The sum of the current flowing towards a junction is equal to sum of the current flowing away from it.

Kirchhoff's voltage law

In a closed circuit the sum of the potential drop is equal to the sum of the potential rises.

8.Define frequency

The number of cycles completed per second is called frequency

$$f = \frac{1}{T} Hertz$$

9.What is meant by average value ?

Average value $\frac{Area\ under\ the\ curve\ over\ one\ complete\ cycle}{Base(time\ period)}$

10.Define RMS value.

The effective value of an alternating current is that the value of direct current which produces the same heat as that produced by the alternating current when passed through the same resistance for the same interval of time .

$$RMS\ value = \sqrt{\frac{Area\ of\ the\ sqaure\ curve\ for\ one\ cycle}{period}}$$

11.Define form factor.$Form\ factor = \frac{RMS\ value}{Average\ value}$

12.Define Crest factor(peak factor)

$$maximum\ value = \frac{Maximum\ value}{RMS\ value}$$

13.Define Inductance

Inductance is the property of the coil by which it opposes any change of current .Its unit is henry.It stores the energy in electromagnetic field.

14.Define capacitance .

A capacitor is a element which store the energy in electrostatic field. It is formed by two parallel plates separated by an insulating medium.

$$E \propto q \ or \ \ e = \frac{q}{c}$$

15.Define power factor.

The power factor is the cosine of the phase angle between voltage and current.

$$power\ factor = \frac{real\ power}{apparent\ power}$$

16.Define real power

The actual power consumed in an ac circuit is called real power .

$$P = EI\ cos\emptyset$$

17.Define reactive power

The power consumed by a pure reactance in an ac circuit is called a reactive power .Its unit is VAR.

$$Q = EIsin\emptyset$$

18.Define apparent power

It is given by the product of rms value of voltage current .Its unit is volt amperes.

$$S = EI$$

19.What is meant by balanced system?

A balanced system means that the currents in the three phases are equal in magnitude and are displaced from one another by $120°$

20.Define phase voltage and phase current.

Phase voltage nothing but voltage across each winding .the current flowing in the phases is called phase current.

21.Define line voltage and line current .

The line voltage is nothing but voltage across any two lines .The current flowing in the lines is called line current.

22.What is the relation between line voltage and phase voltage for star delta connection?

For star connection $E_L = \sqrt{3}E_{ph}$

For delta connection $E_L = E_{ph}$

23.What is the relation between line current and phase current for star and delta connection?

For star connection

$I_L = I_{ph}$

For delta connection $I_L = \sqrt{3} I_{ph}$

UNIT-II ELECTRICAL MACHINES

1.What is an electrical generator?

An electrical generator is a machine which converts mechanical energy into electrical energy .

2.What is the basic principle of a dc generator?

Basic principle of dc generator is Faradays law of electromagnetic induction .i.e. whenever a conductor is moved in a magnetic field ,dynamically induced emf is produced in that conductor.

3.What are the major parts of a dc generator?

Magnetic frame

Poles

Armature

Commutator

Brushes

4.What is the purpose of yoke in a dc machine?

It acts as a protecting cover for the whole machine and provides mechanical support for the poles.

It carries the magnetic flux produced by the poles .The flux per pole divides at the yoke so that the yoke carries only half the flux produced by each pole.

5.What is the purpose of interpoles in modern dc machine?

In modern machines commutating poles or inter poles are provided to improve commutation.

6.Why as the armature core is made of laminations?

The armature core is made of laminations in order to reduce the eddy current losses.

7.How do you reduce the hysteresis loss in armature?

The hysteresis losses can be reduced by using low hysteresis steel containing few percentage of silicon.

8.What are the types of windings used in dc machine?

Lap winding

Wave winding

9. What is the function of commutator in dc generator?

The commutator converts the alternating emf into unidirectional or direct emf.

10.What is the main use of brush in a dc generator?

The brushes are mainly used to collect current from the commutator

11.Write down the emf equation of a dc generator.

$$E_g = \frac{N\text{Ø}ZP}{60A} volts$$

For lap winding A=P for wave winding A=2

12.What are the different types of dc generator?

Separately excited dc generator

Self excited dc generator

Series generator

Shunt generator

Compound generator

Long shunt compound

Short shunt compound

13.What are the applications of dc generator?.

Series generator-boosters

Compound generator-self contained generator unit

Shunt generator-battery charging

14.Why is the air gap made of as small as possible between the armature and the poles in a dc machine?

The air gap is made as small as possible between the armature and the poles in a dc machine in order to reduce the reluctance of the magnetic path.

15.What is the function of armature in a dc generator?

Its function is to rotate the conductors in a uniform magnetic field and provide a path of very low reluctance to the magnetic flux.

16.What is an electric motor?.

Electric motor is a machine which converts electrical energy into mechanical energy.

17.What is the basic principle of operation of a dc motor?

The basic principle of operation of a dc motor is that a current carrying conductor placed in a magnetic field experiences a force tending to move it.

18.Define back emf.

When a motor rotates the conductors housed in the armature also rotate and cut the magnetic lines of force.So and emf is induced in the armature conductors and this induced emf opposes the supply voltage as per Lenz law.This induced emf is called back emf or counter emf.$E_b = \frac{N\emptyset ZP}{60A} volts$

19.What is the nature of the current flowing in the armature conductors of a dc motor?

Alternating current is flowing through the armature .This alternating current is converted into dc by using commutator.

20.State Fleming's Left hand rule.

The direction of rotation is given by Fleming's left hand rule.If the thumb ,fore finger and middle finger of the left hand are held such that the three fingers are at mutually perpendicular directions and if the fore finger indicates direction of the field and the middle finger ,the direction of current then the thumb points to the direction of rotation.

21.Write down the voltage equation of a dc motor.

Voltage equation of a dc motor is given by

$V = E_b + I_a R_a$

Where $\mathrm{V} - \text{applied voltage}$

$E_b - back\ emf$

$I_a = armature\ current$

$R_a = armature\ resistance$

22.What is the condition for maximum power developed in a armature?

The condition for maximum power developed in armature is when the back emf is equal to half of the input voltage $E_b = \frac{V}{2}$

23.What are the different types of dc motors?

The types of dc motors are

Separately excited DC motor

Self excited dc motor

Series motor

Shunt motor

Compound motor

24.What is a separately excited dc motor?

In this motor field winding and armature windings are separated .The field winding is excited by a separate source.Thats why it is called separately excited dc motor.

25.What is a dc series motor?

In a dc series motor the field winding is connected in series with the armature.The field winding should have less number turns of thick wire.

26.What is a dc shunt motor?

In a dc shunt motor the field winding is connected across the armature.The shunt field winding has more number of turns and less cross sectional area.

27.Why a dc shunt motor is also called a constant flux motor or constant speed motor?

In shunt motor flux produced by field winding is proportional to the field current .Here the input voltage is constant and so flux is also constant .Therefore DC shunt motor is also called as a constant flux motor or constant speed motor.

28.What is a compound motor?

A dc motor consisting of both series and shunt field windings is called a compound motor.

29.Why series motor cannot be started without any load ?

In dc series motor flux is directly proportional to armature current.i.e.Under no load condition the armature current is very low and flux also be less.By using the formula speed inversely proportional to the flux .if flux is less speed will be very high. Due to this, motor will be damaged .Hence dc series motor should always be started with some load on the shaft.

30.Define the term speed regulation of a dc motor.

$$speed\ regulation = \frac{no\ load\ sped - full\ load\ speed}{full\ load\ speed}$$

31.Write down the torque equation of a dc motor.

$$T_a = \frac{0.159 \emptyset I_a PZ}{A} Nm$$

Where $T_a = torque\ in\ Nm$

$\emptyset = flux\ per\ pole\ in\ wb$

$I_a = armature\ current\ in\ amps$

$P = number\ of\ poles$

$Z = total\ number\ of\ armature\ conductors$

$A = number\ of\ parallel\ paths$

32.What are the applications of dc series motors?

Shunt motors-centrifugal pumps,laths,light machine tools

Series motor-electric trains ,cranes,hoists lifts,blowers,conveyors

Compound motors-punch machines,shears

33.What is meant by a transformer?

The transformer is a static device which transfer electric energy from one end to another end without change in the frequency.

34.What are the different types of transformer?

Core type

Shell type

35.Write down the emf equation of a transformer.

$$E_1 = 4.44 f \emptyset_m N_1$$

$$E_2 = 4.44 f \emptyset_m N_2$$

$f - frequency\ of\ the\ supply$

$N_1, N_2 - are\ the\ number\ of\ turns\ in\ the\ primary\ and\ secondary\ windings\ respectively$

$\emptyset_m - maximum\ value\ of\ the\ flux$

36.Define voltage transformation ratio.

The ratio of secondary induced emf to primary induced emf is called voltage transformation ratio

$$\frac{E_2}{E_1} = \frac{N_2}{N_1} = k$$

37.Define slip.

The slip of an induction motor is defined as the ratio of difference between synchronous speed and rotor speed

$$\%S = \frac{N_s - N}{N} * 100$$

38.Why the single phase induction motor is not self starting?

There is no starting torque in the single phase induction motor.Therefore the rotor doesnot rotate .Thats why single phase induction motor is not self starting.

39.What are the different types of single phase induction motor?

Split phase induction motor

Capacitor start induction motor

Capacitor run induction motor

Capacitor start capacitor run induction motor

Shaded pole induction motor

40.What are the applications of split phase induction motor?

Blowers

Fans

Centrifugal pumps

Washing machines

41.How the rotor rotates in the single phase induction motor?

The starting method of single phase induction motor is very simple .An auxiliary winding I the stator is provided in addition to main winding. Then the induction motor starts as two phase motor. The main winding and auxiliary windings are displaced by 90 electrical degrees. The impedances of the windings

differ and currents in the main and auxiliary windings are phase shifted from each other .As a result of this rotating stator field is produced .Then the rotor rotates

UNIT-III Semiconductor devices and applications

1.Define an electron volt

An electron volt can be defined as the amount of energy gained or lost when an electron falls through and moves against potential difference of one volt

2.What is forbidden energy gap?

The upper most band is conduction band and the lower one is valence band these two bands are separated by a gap which is known as forbidden energy gap.

3.What is a conductor?

Conductor is a material that easily conduct the current.The best conductors are single element material such as copper ,silver gold and aluminium ie these atoms have only one valence electrons

4.What is semiconductor?

A semiconductor material is an element with 4 valence electrons and whose electrical properties lie in between that of insulators and conductors

5.What are the classifications of semiconductors?

Intrinsic or pure semiconductors

Extrinsic or impure semiconductors

N-type

P-type

6.What is insulators?

Insulators are those in which eight valence electrons and are bound very tightly to parent atoms thus requiring very large electric field to remove them from attraction of their nucleus.In other words insulators insulators have no free charge carrier available with them under normal condition.

7.What is intrinsic semiconductor?

The pure form of semiconductor material is known as intrinsic semiconductor examples pure germanium and silicon which have the forbidden energy gap of 0.72 and 1.1eV

8.What is doping?

Doping is the process by which conductivity of the semiconductor is increased .Doping means adding an impurity into a pure form of semiconductor to improve its electrical conductivity.

9.What is N type semiconductor?

When a pentavalent impurity is added to a intrinsic semiconductor (pure germanium crytal),N type semiconductor is obtained .Example for pentavalent impurity are arsenic,antimony

10.What is P type semiconductor?

When a small amount of trivalent impurity is added to a pure semiconductor P type semiconductor is formed .Example for the trivalent are boron gallium,indium etc.

11.Compare intrinsic semiconductor and extrinsic semiconductor.

Intrinsic semiconductor

i) It's a pure form of semiconductor
ii) Number of electrons and holes are equal
iii) Conductivity is poor

Extrinsic semiconductor

i) An impurity or doping agent is added in the pure semiconductor forms extrinsic semiconductor
ii) Number of electrons and holes are nto equal because of doping
iii) Conductivity is improved

12.What is PN junction?

The PN junction is produced by placing a layer of P type semiconductor next to the layer of N type semiconductor .The contact surface is called the PN junction

13.What is forward biasing?

If the positive terminal of the voltage source is connected to the P side and the negative terminal of the source is connected to the N side of the diode then the diode is said to be forward biased.

14. What is breakdown voltage?

It is defined as the reverse voltage at which the PN junction breaks down with sudden rise in reverse current.

15.What is cut in or Knee voltage?

The forward voltage at which the current through the junction starts increasing rapidly is called as knee voltage or cut in voltage.

16.Mention some of the applications of zener diode

voltage regulator

clippers in wave shaping circuits

square wave generators

fixing reference voltage in electronic circuits such as power supplies and transistor biasing.

17.What is a rectifier?

A rectifier convert the ac voltage to a unidirectional or pulsating voltage.

18.What do you mean by ripple factor?

The ripple factor is defined as the ratio of the effective value or rms value of the ac component of voltage or current to the average value of voltage or current.

19.Define peak inverse voltage

This is the maximum voltage with which the rectifier has to withstand during reverse biasing.

20.Deifne TUF

It is defined as the ratio of dc power delivered to the load to the arc rating of transformer secondary.

21.What are the advantages and disadvantages of full wave bridge rectifier?

Advantages

i) transformer with center tap in secondary is not required
ii) as two diodes are connected in series in each conducting of positive and negative cycle the peak inverse voltage is shared by both the diodes equally hence it is suitable for high voltage application.
iii) The transformer which is connected to bridge rectifier can be small in size for a given output and current flows in both primary and secondary during both positive and negative cycle of the input voltage.

Disadvantages

i) additional two diodes are required
ii) the rectifier efficiency is slightly reduced than the FWR because the additional voltage drop and losses are higher as the two diodes are connected in series

22.What is the peak inverse voltage of center tapped full wave rectifier?

PIV=2Vm

23.What is the peak inverse voltage of half wave rectifier?

PIV=Vm

UNIT –IV DIGITAL ELECTRONICS

1.Define BIT and BYTE

BIT:It is an abbreviation of the word binary digit and smallest unit of information .It is either 0 or 1

BYTE It is a string or group of eight bits

2.State De morgans theorem

De morgans first law: This law states that the complement of the sum of the variables equals the product of a complement of each variables.

$$\overline{A+B} = \bar{A}.\bar{B}$$

Demorgans second law:This law states that the complement of a product equals the sum of the complements of each variables

$$\overline{A.B} = \bar{A}+\bar{B}$$

3.What is the use of Demorgans theorem?

It can be used in the minimization of Boolean expressions. Complements of two or more variables ANDed is the same as the ORing complement of the individual.Therefore interchange of AND and OR is possible.

4.What is duality law?

Duality principles states that every algebraic expression deducible from the postulates of Boolean algebra remains valid if the operators and idenfied elements are interchanged.

5.State the laws of Boolean algebra.

$$A+0=A$$

$$A+1=1$$

$$A+A=A$$

$A + \bar{A} = 1$

$A + AB = A$

$A.1 = A$

$A.0 = 0$

$A.A = A$

$A.\bar{A} = 0$

$\bar{\bar{A}} = A$

6.What is an inverter?

A NOT gate otherwise called as an inverter,since what ever input is given the complemented or the inverted output will be obtained.

7.Define positive logic

When the high voltage or more positive voltage level is associated with binary 1 while the low voltage or less positive level is associated with binary 0then the system adhering to this is called positive logic system

8.Define negative logic

When the high voltage level is associated with binary 0 while the low voltage level is associated with binary 1 then the system adhering to this is called negative logic system.

9.What is a half adder?

A combinational circuit that performs the addition of two bits is called a half adder.Here two one bit words are added resulting in two bits of data namely sum and carry.

10.What are universal gates ?

NAND and NOR gates are universal gates because all other gates can be derived from NAND and NOR gates.

11.Distinguish between half adder and full adder

Half adder

It can add only two bits at a time.

No such possibilities exist for half adder

Full adder

It can add three bits at a time.

A full adder circuit can be obtained by combining two half adder with a OR gate.

12.List different types of flipflop

RS flip flop

Clocked RS flip flop

D-type flip flop

T type flip flop

JK flipflop

JK master slave flipflop

13.What are the applications of flip flop?

Various applications of flip flops are

In data storage

In frequency division

In data transfer

In digital counters

14.What do you mean by triggering of flip-flop?

The sate of a flip-flop is switched by a momentary change in the input signal. This momentary change is called as trigger and the transition it causes is said to trigger the flip-flop.

15.Name the different types of triggering employed in a flip-flop

The different types of triggering are

Level triggering

Pulse triggering

Positive edge triggering

Negative edge triggering

16.What is meant by racing in the operation of a flip flop ?

This race condition arises when the width of the clock pulse is greater than the propagation delay time of the flip flop

When J=K=1 and Q is also 1.The next pulse will cause Q to switch to 0,but due to toggling the output will oscillate between 1 and 0 this is called race around condition.

17.State a method to avoid racing is JK flip flop?

Race problem is avoided by using two JK flip flop is cascade called as master slave flip flop.This clock pulses applied at the master are inverted and applied to the slave.It employs a feed abck from the output of the second flip flop to the input of the first flip flop.

18.Difference between SR flip flop and JK flip flop.

The S=R=1 conditon is a forbidden one in SR flip flop

In JK flip flop when J=1 K=1 it works as a T flip flop

19.What is synchronous counter?

In synchronous counter the clock pulse is applied simultaneously to all flip flops.The output of the flip flops change state at the same instant .The speed of operation is high compared to the synchronous counter.

20.What is an asynchronous counter?

In an asynchronous counter the clock pulse is applied to only one flip flop .The change of state in the output of this flip flop serves as a clock pulse to the next flip flop and so on .Here all the flip flops do not change state at the same instant.Hence asynchronous in nature.

21.Name the different types of counters.

Synchronous counter

Asynchronous counter

i)up counter

ii)Modulo N counter

iii)Down counter

iv)Up/Down counter

22.What is an Upcounter?

A counter that increments the output by one binary number each time a clock pulse is applied or received

23.What is a ripple counter?

A ripple counter is nothing but an asynchronous counter in which the output of the flip flop change state like a ripple in water(when a stone is thrown in to a pond).Hence the name ripple counter.It also formed by connecting each flip flop output to the T lead of the next stage.

24.What is meant by modulus of a counter?

Modulus of a counter is the number of states through which a counter can progress.

25.What is a ring counter?

A counter formed by circulating a 1 in a shift register whose serial output has been connected to its serial input.

26.What is a register?

A memory element capable of containing one binary word.It consists of a group of flip flops which store the binary information.

27.What are the four types of shift register?

The four types of shift registers are

Serial in serial out(SISO)

Serial in Parallel out(SIPO)

Parallel in Parallel out(PIPO)

Parallel in serial out(PISO)

28.Give the applications of shift registers

To introduce time delay

Serial to parallel converter

Parallel to serial converter

Sequence generator

Ring counter

29.State the difference between sequential circuits and combinational circuits.

Sequential circuit is a digital circuit whose logic state depend on a specified time sequence.It is a combinational circuit together with a memory element in feed back.

Combinational logic circuit is a system in which the output occurs in direct immediate response to the input.

UNIT –V FUNDAMENTALS OF COMMUNICATION ENGINEERING

1.Define communication

The term communication refers to the process of transfer of data /message from one place to another.

2.What is a transducer ?

A transducer is a device which converts one form of energy to another form of energy

Examples micro phone ,loud speaker

3.What are the basic types of communication?

i) wire line communication system
ii) wireless communication system

4.What is an antenna?

An antenna is a transducer which converts the electrical energy to electromagnetic energy to ease transmission of message through free space. At the receiver we make use of a receiving antenna and convert the electromagnetic signal back to electrical signal

5.Define modulation

modulation is basically a process of increasing the frequency of the signal to be transmitted. In the process of modulation we take a high frequency signal called as carrier signal and vary some characteristics of the carrier signal like amplitude frequency or phase in accordance with the instantaneous amplitude variation of the message signal.

6.What are the types of modulation?

Modulation can be broadly classified into two types based on the nature of carrier signal

i) sinusoidal modulation
ii) pulse modulation

7.Define amplitude modulation

In amplitude modulation the amplitude of the carrier is varied in accordance with the instantaneous amplitude of the message signal. Whenever the modulating signal reaches maximum amplitude the amplitude of the carrier is also made higher and whenever the message signal reaches minimum amplitude the amplitude of the carrier is also minimum

8.Define frequency modulation

in frequency modulation the frequency of the carrier signal is varied in accordance to the instantaneous amplitude of the message signal. Whenever the amplitude of the message signal is high FM wave has higher frequency and whenever the amplitude of the message is low frequency of FM wave is also less.

9.What is meant by modulation index for AM wave?

Modulation for AM is define as the ratio of modulating signal amplitude to carrier to carrier signal amplitude

10.What is the bandwidth for AM wave?

Bandwidth is the difference between highest and lowest frequencies in the transmission of AM wave

Bandwidth=upper side band frequency-lower side band frequency

Bandwidth of AM is equal to twice the modulating signal frequency.

11.Define modulation index for FM wave.

The modulation index of FM is define as the ratio of frequency deviation to modulating signal frequency. The value of modulation index for FM is normally greater than 1

12.What is meant by sampling

sampling is the process of taking the samples of a continuous time signal at regular interval of time

13.Classify the frequency range of radio waves.

Class	frequency
Very low frequency	10-30KHz
Low frequency	30-300KHz
Medium frequency	300-3000KHz
High frequency	3-30MHz
Very high frequency	30-300MHz
Ultra high frequency	300-3000MHz

Super high frequency 3000-30000MHz

14.What is the radio transmitter?

The transmitter is the electronic unit that accepts the information signal to be transmitted and converts it into an RF signal capable of being transmitted over long distances.

15.What are the primary functions of a radio receiver?

A radio receiver is required to perform three main functions

i) selection of the desired frequency from a large number of modulated carrier frequencies that strike the receiving antenna at the same time.
ii) Separation of the modulating audio frequencies from the modulated carrier frequency by the process of detection or demodulation.

16..What is meant by signal to noise ratio and noise figure of a receiver?

It may be defined as the ratio of the signal to noise powered at the receiver output

Noise figure of a receiver

It is defined as the ratio of input and output signal to noise ratios of a receiver or circuit

17.What is frequency interleaving?

The process of accommodating information from one signal in the gaps occurring in the spectrum of another signal is called interleaving.

18.What is the apogee and perigee in satellite communication?

Apogee is the farthest point on the orbit of a satellite from the earth

Perigee is the nearest point on the orbit of a satellite from the earth

19.What are the modes of propagation in a optical fiber?

Modes are the various paths the light can take in traveling down the fiber

Single mode: If there is only one path for light to take down the cable it is called single mode

Multimode: If there are more than one path it is called multimode

20.Define numerical aperture.

The numerical aperture is a measure of the light gathering ability of an optical fiber. The fiber with a large numerical aperture accepts more light when compared to fiber with small numerical aperture.