



GE6252 -Basic Electrical and Electronics Engineering

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING UNIT I ELECTRICAL CIRCUITS AND MEASUREMENTS

1. What is charge?

The charge is an electrical property of the atom particles of which matter consists. The unit of charge is coulomb.

2. Define current.

The flow of free electron in a metal is called electric current. The unit current is ampere.

$$\text{Current (I)} = Q / t$$

Where, Q is the total charge transferred in coulomb. t is the time required to transfer the charge.

3. Under what condition AC circuit said to be resonant?

If the inductive reactance of the circuit is equal to capacitive reactance then the circuit is said to be resonance. $X_L = X_C$

4. Define voltage.

The potential difference between two points in an electric circuit called voltage. The unit of voltage is the volt. Voltage represented by V or v.

5. Define power. (May 2006 and May 2007)

The rate of doing work by electrical energy or energy supplied per unit time is called the power. Its unit is watts

$$P = V I; P = I^2 R; P = E^2 / R. P = \text{Energy} / \text{time} = W/t$$

6. Define resistance.

Resistance is the property of a substance, which opposes the flow of electric current. Also it can be considered as electric friction. Whenever current flows through a resistor, a voltage drop occurs in it and it is dissipated in the form of heat. Unit of resistance is ohm. Symbol is measured with a help of ohmmeter.

7. Define international ohm.

International ohm is defined as the resistance offered to the flow of current by a column of mercury of length 106.3cm; 14.452gm in mass with uniform cross section at 0 °C.

8. What are the factors affecting resistance?

- (i) Length – $R \propto L / a$
- (ii) Area of cross section - $R \propto L / a$
- (iii) Nature and property of the material - $R \propto \rho$
- (iv) Conductance and conductivity – $G = 1/R$

9. What is meant by electrical energy? Energy is the total amount of work done and hence is the product of power and time.

$$W = Pt = EIt = I^2 Rt = E^2 / Rt \text{ Joules (watt – second)}$$

10. Write down the expression for effective resistance when three resistances are connected in series and parallel.

For series connection (for three resistors)

$$R = R_1 + R_2 + R_3$$

For parallel connection (for two resistors)

$$R = R_1 R_2 / (R_1 + R_2)$$

11. State Kirchhoff's laws. (Dec 2004, May 2006) Kirchhoff's current law

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

Kirchhoff's voltage law

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

12. What is series circuit?

When the resistors connected in a circuit such that the current flowing through them is same is called as series circuit.

13. What is parallel circuit?

When resistors are connected across one another so that same voltage applied to each, then they are said to be in parallel the circuit is called as parallel circuit.

14. **State Ohm's law.** When temperature remains constant, current flowing through a circuit is directly

proportional to potential difference across the conductor. $V = I \cdot R$ (Volts)

1. **Define form factor.** Form factor = RMS value / Average value
2. **Define crest (peak) factor.**

Crest (peak) factor = Maximum value / RMS value

1. **Define apparent power. (May 2005)** The maximum power consumed by the circuit is called apparent power. The unit VA. $S = VI$.
2. **Define RMS value (May 2006)**

It is the mean of the squares of the instantaneous value of current over one complete cycle.

1. **Define international ohm.** International ohm is defined as the resistance offered to the flow of current by a column of mercury of length 106.3cm; 14.452gm in mass with uniform cross section at 0°C .
2. **Define capacitance.**

A capacitor is a circuit element that, like the inductor, stores energy during periods of time and return the energy during others. In the capacitor, storage takes place in an electric field unlike the inductance where storage is magnetic field. Two parallel plates separated by an insulating medium form a capacitor. The emf across the capacitor is proportional to the charge in it i.e q or $e = q/C$, Where, C is constant called capacitance.

Unit – II Electrical Machines

1. What is an electric generator?

An electrical machine, which converts mechanical energy into electrical Energy, is called as electric generator.

2. What is an electric motor?

An electrical machine, which converts electrical energy into mechanical Energy, is called as electric motor.

3. What is meant by magnetic flux?

The magnetic lines of force existing around a magnet is called magnetic flux. It's unit is Weber. $1\text{wb}=10^8$ magnetic flux lines

4. State faraday's law of electromagnetic induction.

Whenever a conductor cuts the magnetic lines of force an emf is induced in it.

5. What is the use of commutator?

A device is used in a dc generator to convert the alternating emf into unidirectional emf is called commutator.

6. What is the function yoke?

It serves the purpose of outermost cover of the dc machine. So that the insulating material gets protected from harmful atmospheric elements like moisture, dust and various gases like SO₂, acidic fumes etc. It provides mechanical support to the poles.

7. What is the choice of material for the following?

1. Yoke 2.pole 3.Field winding 4.Armature winding

1. **Yoke:** It is prepared by using cast iron because it is cheapest.

2. **Pole:**

It is made up of cast iron or cast steel.

1. **Field winding:** It is made up of aluminium or copper.

2. **Armature winding:** It is made up of cast iron or cast steel.

8. Give the emf equation of dc generator.

$E = ZNP/60A$ where $E \Rightarrow$ Generated emf in volts \Rightarrow Flux produced per pole in Weber

$Z \Rightarrow$ Total no. of conductors $N \Rightarrow$ Speed of armature in rpm

$E = ZN/60$ for lap winding $A=P$ $E = ZNP/120$ for wave winding $A=2$

9. What are all the two types of excitation?

i. Separate excitation

When the field winding is supplied from external, separate dc supply i.e. Excitation of field winding is separate then the generator is called separately excited generator.

ii. Self excitation

When the field winding is supplied from the armature of the generator itself then it is called as self-excitation.

10. What is meant by residual magnetism?

Practically though the generator is not working, without any current through field winding, the field poles possess some magnetic flux. This is called as residual magnetism.

11. State that the Fleming's left hand rule.

The rule states that outstretch the three fingers of the left hand namely the first finger, middle finger and thumb such that they are mutually perpendicular to each other. Now point the first finger in the direction of magnetic field and the middle finger in the direction of the current then the thumb gives the direction of the force experienced by the conductor.

12. What is Lenz's law?

Lenz's law states the direction of induced emf is always so as to oppose the cause producing it

13. List the different types of DC motor.

DC series motor

DC Shunt motor

DC Compound motor

Long shunt compound motor

Short shunt compound motor

14. What do you mean by speed regulation?

The speed regulation of a DC motor is defined as the ratio of change in speed corresponding to no load and full load condition to speed corresponding to full load. It's expressed as

$$\text{Speed regulation} = \frac{N_{\text{no load}} - N_{\text{full load}}}{N_{\text{full load}}}$$

15. List out the characteristics of DC motor

i. Torque-Armature current characteristics (T vs Ia) ii. Speed-Armature current characteristics (N vs Ia)

16. What are all the applications of DC motor? DC

Shunt motor: Blowers and fans Centrifugal and reciprocating pumps Lathe machines Machine tools Milling machines Drilling machines

17. What is the necessity of starter?

To restrict high starting armature current, a variable resistance is connected in series with the e armature at start. This resistance is called starter.

18. What are all the factors affecting the speed of a DC motor?

The flux

The voltage across the armature

The applied voltage

19. What is meant by Swinburne's test?

Without actually loading the motor the losses and hence efficiency at different loads can be found out.

20. List out the applications of various types of generators.

Separately excited generator As a separate supply is required to excite the field, the use is restricted to some special applications like electroplating, electro refining of materials etc

Shunt generator

Commonly used in battery charging and ordinary lighting purposes.

Series Generators

Commonly used as boosters on dc feeders, as a constant current generators for welding generator and arc lamps.

Cumulatively compound generators

These are used for domestic lighting purposes and to transmit energy over long distance.

Differential compound generator

The use of this type of generators is very

Unit – III Electron Devices

1. Define Transistor

Transistor consists of two junctions formed by sandwiching either P-type or N-type semiconductor between a pair of opposite types.

2. Write the current amplification factor for a CB transistor.

= Change in Collector Current / at constant VCB Change in emitter current 3. **Write**

the current amplification factor for a CE transistor. = Change in Collector Current /Change

in base current at constant VCE

4. Define transistor action.

A transistor consists of 2 coupled PN junctions. The base is a common region to both junctions and makes a coupling between them. Since the base regions are smaller, a significant interaction between junctions will be available. This is called transistor actions.

1. **Define rise time** It is the time required for the current to rise from 0 to 90 percentage of the maximum value.

2. Define turn-on time

It is the time required for the current to rise from 0 to 90 percentage of the maximum value $t_{on} = t_d + t_r$

1. **Define fall time** It is the time required for the Collector current to fall from 90 to 10 percentage of I_{cs} .

2. Define turn-off time

It is the time required to fall from 100 to 90 percent of I_{cs} . $T_{off} = t_s + t_r$

9. Define hybrid parameters.

Any linear circuit having input and output terminals can be analysed by four parameters (one measured in ohm, one in mho and two dimensionless) called hybrid or h- parameters.

10. What are the use of h - Parameters? It perfectly isolates the input and output circuits. Its source and load currents are taken into account.

11. Define power transistors

Power transistors are those which handle a large amount of current and also dissipates large amount of power across collector base junction.

12. What are the advantages of transistors?

1. Low operating voltage.
2. Higher efficiency.
3. Small size and ruggedness

13. What are the types of transistors?

Unipolar junction transistor Bipolar junction transistor.

14. What is mean by characteristics of transistor?

The interrelation of the various currents and voltages can be plotted graphically which are commonly known as the characteristics of transistor.

15. What are the types of BJT?

n-p-n type. p-n-p ype.

Unit – IV Fundamentals of Digital Circuits

1) Define binary logic?

Binary logic consists of binary variables and logical operations. The variables are designated by the alphabets such as A, B, C, x, y, z, etc., with each variable having only two distinct values: 1 and 0. There are three basic logic operations: AND, OR, and NOT.

2) Convert (634) 8 to binary

6 3 4 110 011 100

Ans = 110011100

3) Convert (9B2 - 1A) H to its decimal equivalent.

$$N = 9 \times 16^2 + B \times 16^1 + 2 \times 16^0 + 1 \times 16^{-1} + A (10) \times 16^{-2}$$

$$= 2304 + 176 + 2 + 0.0625 + 0.039$$

$$= 2482.110$$

$$16^2 \quad -6$$

$$16^1 \quad -1$$

$$0$$

4) State the different

classification of binary codes?

1. Weighted codes
2. Non - weighted codes
3. Reflective codes

4. Sequential codes
5. Alphanumeric codes
6. Error Detecting and correcting codes.

5) Convert 0.640625 decimal number to its octal equivalent.

$$0.640625 \times 8 = 5.125 \qquad 0.125 \times 8 = 1.0 = 0.640625_{10} = (0.51)_8$$

6) Convert 0.1289062 decimal number to its hex equivalent

$$0.1289062 \times 16 = 2.0625 \quad 0.0625 \times 16 = 1.0 = 0.21_{16}$$

7) Convert 22.64 to hexadecimal number. (NOV 2005)

$$0.64 \times 16 = 10.24$$

$$0.24 \times 16 = 3.84$$

$$0.84 \times 16 = 13.44$$

$$.44 \times 16 = 7.04 \text{ Ans} \quad = (16. A3 D7)_{16}$$

8) State the steps involved in Gray to binary conversion?

The MSB of the binary number is the same as the MSB of the gray code number. So write it down. To obtain the next binary digit, perform an exclusive OR operation between the bit just written down and the next gray code bit. Write down the result.

9) Convert gray code 101011 into its binary equivalent.

GrayCode: 1 0 1 0 1 1 BinaryCode: 1 1 0 0 1 0

10) Subtract (0 1 0 1)₂ from (10 1 1)₂

10 1 0 0 1 0 1

Answer = 0 1 1 0

11) Add (10 1 0)₂ and (00 1 1)₂ (APR 2005)

1 0 1 0 0 0 1 1 Answer = (1 1 0 1)₂

12) Using 10's complement subtract 72532 - 3250

$$M = 72532$$

10's complement of N = + 96750 Sum = 169282 Discard end carry

$$\text{Answer} = 69282$$

13) Find 2's complement of (10 1 0 0 0 1 1) 2

01 0 1 1 1 0 0 1 -1's Complement

+1 01 0 1 1 1 0 1 0 -2's complement.

14) Subtract 1 1 1 0 0 1 2 from 1 0 1 0 1 1 2 using 2's complement method

10 1 0 1 1

+ 0 0 0 1 1 1 -2's comp. of 1 1 1 0 0 1 1 1 0 0 1 0 in 2's complement form Answer (00 11 1

0) 2 15) **List the different number systems?** i) Decimal Number system ii) Binary Number system iii) Octal Number system iv) Hexadecimal Number system

16) State the abbreviations of ASCII and EBCDIC code? (DEC 2005)

ASCII-American Standard Code for Information Interchange.

EBCDIC-Extended Binary Coded Decimal Information Code.

17) Write the names of basic logical operators.

1. NOT / INVERT

2. AND

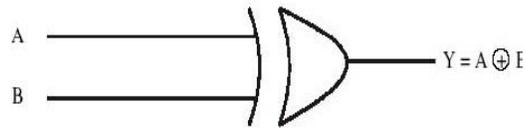
3. 3. OR 18) **Reduce $AB + (AC)' + AB'C(AB + C)$**

$$AB + (AC)' + AB'C(AB + C) = AB + (AC)' + AAB'BC + AB'CC$$

$$= AB + (AC)' + AB'CC \quad [A.A' = 0]$$

$$[A.A = 1] [(AB)' = A' + B']$$

Logic Symbol



Truth Table

Inputs		Output
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

$$[A + A'B = A + B]$$

$$[A + 1 = 1]$$

$$[A + A = 1]$$

the two input EX –

Unit – V Communication Engineering

1. What is communication ?

Transfer of information from one place to another is called communication.

2. What are the types of signals?

1. Analog signals 2. Digital signals

3. Give few examples of Analog signals?

1. Telephone signal 2. Radio broadcast signal 3. T.V signal

4. Define modulation?

Modulation is the process of changing some parameters of a high frequency carrier signal in accordance with the instantaneous variation of the message signal

5. What are the processes involved in analog to digital conversion?

1.Sampling 2.Quantization 3.Encoding

6. Write down few waveform coding technique.

1.PCM- Pulse code modulation 2.DCPH- Differential pulse code modulation
3.DM- Delta modulation 4.ADM- Adaptive delta modulation.

7. Based on the modulation index classify AM modulator'

1.Under modulation 2.Critical modulation 3.Over modulation

8. Define angle modulation.

Angle modulation is the process by which the angle of the carrier signal is varied in accordance with the amplitude variation of the message signal 10. Classify angle modulation.

1. Frequency modulation
2. Phase modulation.

9. Define modulation index in case of FM.

$m = \Delta f / f_m = \text{maximum frequency deviation} / \text{modulation frequency}$

10. What is Radio communication?

Radio communication is transmission of speech, music, entertainment programmes. These informations are transmitted as radio waves.

11. Classify Radio receivers.

1. TRF- Tuned radio frequency receiver 2. SHR- Super heterodyne receiver.

12. What are the two types of T.V

1. Monochrome system 2. Color T.V system

13. What is facsimile?

In facsimile process the effective transmission and exact reproduction of still photographs, documents and other maps have to be done.

14. What is microwave?

Electromagnetic waves in the frequency range of 1GHz to 50 GHz are referred as microwaves.

15. List few applications of microwaves communication.

1. Terrestrial microwave links are used to carry telephony, data and T.V signals. 2. Satellite communication uses microwave frequencies for their operations. 3. microwave radiation has also found some medical applications for heating tumors. 4. Microwave can be used for material cutting.

16. Write down the formula for time taken by the satellite for encircling the earth.

v =velocity of the satellite g =gravitational acceleration r =radius of earth.

17. Based on coverage classify the orbits.

1. Polar orbits 2. Inclined orbit $(r+h)/v \cdot t = 2$ 3. Equatorial orbit

18. List few advantages of microwave communication. 1. microwave communication offers wide bandwidth hence more number of channels can be obtained. 2. Line of sight propagation is more reliable when compared to software communication. 3. Improved directivity with an aerial array. 4. Low power requirements in the order of milliwatts and microwaves.