VETRI VINAYAHA COLLEGE OF ENGINEERING AND TECHNOLOGY
THOTTIAM, TRICHY -621 215
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subjectname: GE6252 - Basic Electrical and Electronics Engineering
Year / Departmetn/Semester : I / Common to Mechanical and Civil Engineering / II
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UNIT I
ELECTRICAL CIRCUITS AND MEASUREMENTS

1. What is charge and current ?
   - The charge is an electrical property of the atom particles of which matter consists. The unit of charge is coulomb.
   - The flow of free electron in a metal is called electric current. The unit current is ampere. Current (I) = Q / t
2. Define Voltage and Power.
   - 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.
   - The rate of doing work by electrical energy or energy supplied per unit time is
   - called the power. Its unit is watts

   $P = VI$; $P = I^2R$; $P = E^2 / R$. P = Energy / time = W/t
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. XL=XC

4.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.
5. 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^oC.

6.What are the factors affecting resistance?
   - (i) Length
   - (ii)Area of cross section
   - Nature and property of the material
   - Conductance and conductivity
7. What is meant by electrical energy?
   - Energy is the total amount of work done and hence is the product of power and time. $W = Pt = EIt = I^2Rt = E^2 / Rt$ Joules (watt –second)
8. Write down the expression for effective resistance when three resistances are connected in series and parallel.
   - For series connection (for three resistors) R= R1 + R2 + R3

- For parallel connection (for two resistors) R = R1 R2 /(R1 + R2)

9. State Kirchhoff's laws

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.

10. 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.
11. 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.
12. State Ohm's law.
    - When t e m p e r a t u r e remains constant, current flowing through a circuit is directly proportional to potential deference across the conductor.
      V= I*R(Volts)
13. Define form factor.
    - Form factor = RMS value / Average value
14. Define crest (peak) factor.
    - Crest (peak) factor = Maximum value / RMS value
15. Define apparent power.
    - The maximum power consumed by the circuit is called apparent power. The unit VA. S = VI.
16. Define RMS value
    - It is the mean of the squares of the instantaneous value of current over one complete cycle.
17. 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.

PART- B

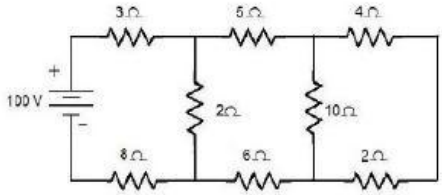
1. (i) State and explain Kirchoff's law. (8)
   (ii) Explain the working of a Dynamometer wattmeter with a neat sketch. (8)
2. (i) Explain any one type of MI instruments. (8)
   (ii) Explain the working principle of PMMC instruments. (8)
3. Explain the construction and principle of operation of single phase energy meter. (16)
4. (i) A series circuit has R=10_, L=50mH, and C=100μF and is supplied with 200V,50Hz. Find (i) Impedance (ii) current (iii) power (iv) power factor (v) voltage drop across the each element. (8)

(ii)Derive the equation for equivalent resistance of number of resistors connected in

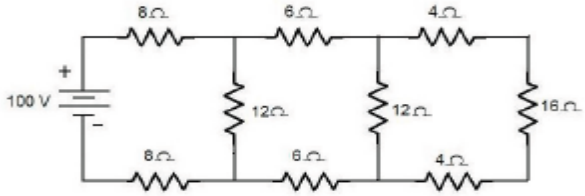
parallel. (8)

5. A 400V is applied to three star connected identical impedances each consisting of a 40 _ resistance in series with 3_ inductance reactance. Find (i) line current (ii) Total power supplied. (16)

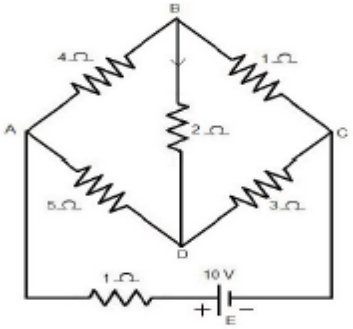
6. Find the current through each branch by network reduction technique. (16)



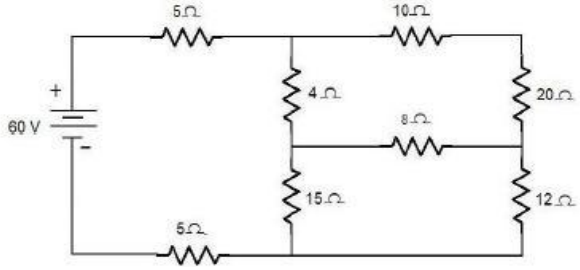
7. Calculate a) the equivalent resistances across the terminals of the supply, b) total current supplied by the source and c) power delivered to 16 ohm resistor in the circuit shown in figure. (16)



8. In the circuit shown, determine the current through the 2 ohm resistor and the total current delivered by the battery. Use Kirchhoff's laws. (16)



9. (i) In the network shown below, find the current delivered by the battery. (10)



(ii) Discuss about voltage and current division principles. (6)

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. 1wb=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.

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

   4. 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 ⇒ Generated emf in volts ⇒Flux produced per pole in Weber

   Z ⇒Total no. of conductors

   N ⇒Speed of armature in rpm E= ZN/60for lap winding

   A=P E= ZNP/120 for wave winding A=2

9. What are all the two types of excitation?
   - **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.

- **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 posses some magnetic flux. This is called as residual magnetism.
11. State that the Fleming's left hand rule.
    - The rules 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 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.
15. What are all the factors affecting the speed of a DC motor?
    - The flux
    - The voltage across the armature The applied voltage
16. What is meant by Swinburne's test?
    - Without actually loading the motor the losses and hence efficiency at different loads can be found out.

17. 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

PART B

1. Explain the construction and principle of operation of a DC generator with neat sketch. (16)
2. (i) Derive the equation for induced EMF of a DC machine. (8)
(ii) Derive the torque equation of DC motor. (8)
3. Describe the construction details of transformer and also explain the principle of operation. (16)
4. (i) Derive the EMF equation of a transformer. (8)
(ii) Explain the principle of operation of DC Motor. (8)
5. Explain the construction and principle of operation of single phase induction motor. (16)
6. A transformer with 40 turns on the high voltage winding is used to step down the voltage from 240V to 120V. Find the number of turns in the low voltage winding. (16)
7. A 4 pole, wave wound generator having 40 slots and 10 conductors placed per slot. The flux per pole is 0.02 wb. Calculate the generated emf when the generator is drive at 1200 rpm. (16)
8. A 25kw, 250V, dc shunt generator has armature and field resistances of 0.06ohm and 100ohm respectively. Determine the total armature power developed when working (1) as a generator delivering 25 kw output and (2) as a motor taking 25kw. (16)

UNIT III
SEMICONDUCTOR DEVICES AND APPLICATIONS

PART A

1. Define Transistor.
   - Transistor consists of two junctions formed by sandwitching 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.
5. Define rise time
   - It is the time required for the current to rise from 0 to 90 percentage of the maximum value.
6. Define turn-on time
   - It is the time required for the current to rise from 0 to 90 percentage of the maximum value ton = td + tr
7. Define fall time
   - It is the time required for the Collector current to fall from 90 to 10 percentage of Ics.

8. Define turn-off time
   - It is the time required to fall from 100 to 90 percent of Ics. Toff=ts+tr
9. Define hybrid parameters.
   - Any linear circuit having input and output terminals can be analysed by four parameters(one measured on 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. What are the advantages of transistors**?**
    - Low operating voltage.
    - Higher efficiency.
    - Small size and ruggedness
12. What are the types of transistors?
    - Unipolar junction transistor
    - Bipolar junction transistor.
13. 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.
14. What are the types of BJT?
    n-p-n Type
    p-n-p Type.

PART B

1. Explain intrinsic and extrinsic semiconductors with neat diagrams. (16)
2. Describe the working of a PN junction diode with neat diagrams. Also explain its V-I characteristics. (16)
3. What is a Zener diode? Explain the operation of Zener diode and draw its characteristics. (16)
4. Explain the operation of half wave rectifier with neat sketch and derive the necessary expression. (16)

5. Explain the operation of centre tapped full wave rectifier with neat diagram. (16)
6. Explain with a neat diagram how the input and output characteristics of a CE configuration can be obtained. (16)

UNIT IV
DIGITAL ELECTRONICS

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 76 + 2 + 0.0625 + 0.039

- Ans= 2482.1 10

4. State the different classification of binary codes?

- Weighted codes
- Non - weighted codes
- Reflective codes
- Sequential codes
- Alphanumeric codes
- Error Detecting and correcting codes.

5. Convert 0.640625 decimal number to its octal equivalent.

0.640625 x 8 = 5.125
0.1258 = 1.0

- Ans =0.640 625 10 = (0.51) 8

6. Convert 0.1289062 decimal number to its hex equivalent

0.1289062 x 16 = 2.0625

0.0625 x 16 = 1.0

- Ans= 0.21 16

7. 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.

8. Convert gray code 101011 into its binary equivalent.

   Gray Code: 1 0 1 0 1 1

   Binary Code: 1 1 0 0 1 0

9. Substract (0 1 0 1) 2 from (1 0 1 1) 2

   1 0 1 0
   0 1 0 1
   - Answer = 0 1 1 0

10. **Add (1 0 1 0) 2 and (0 0 1 1) 2 (APR 2005)**

    1 0 1 0
    0 0 1 1
    - Answer = (1 1 0 1) 2

11. Using 10's complement subtract 72532 - 3250
    - M =72532

    10's complement of N
    = + 96750 Sum =
    169282

    Discard end carry
    - Answer = 69282

12. Convert the given expression in canonical SOP form Y = AC + AB + BC
    - Y = AC + AB + BC
    - =AC (B + B') + AB(C + C') + (A + A')BC
    - =ABC + ABC' + AB'C + AB'C' + ABC + ABC' + ABC

      =ABC + ABC' +AB'C + AB'C' [A + A =1]

PART B

1. Describe in detail about D- flip flop , T- flip flop and JK- flip flop (16)
2. i. Explain the operation of 4-bit synchronous UP counter with a neat diagram (12)
   ii.Express the function XOR gate using NAND gates. (4)
3. Write short notes on (1)J-K Flip flop (2) R-S Flip flop (3) D flip flop (4).Toggle Flip flop (16)
4. i. Express the given function with three AND gates and one OR gate

A'BC + AB'C + ABC' + ABC (10)

ii. Explain the operation of half adder with neat diagram (6)

5. i. Draw the logic diagram of clocked Master – slave JK flip flop and explain its working (8)
   ii. Describe the operation performed by the following arithmetic circuits
   a. Full adder b. Half adder (4+4)
   6. i. Apply Boolean laws and Simplify the following Boolean expression a. XY + X'Z + YZ
   b. (A'+B+C')**.(** A+B+C)**.** (C+D) (8)

   ii. Explain the working of JK- flip flop with its logic diagram (8)
6. Discuss the working principle of D/A and A/D converters (16)
7. With necessary diagrams explain the function of any one type of ADC and DAC (16)

8. i. Explain the operation of successive approximation type ADC with a neat sketch (8)
   ii.Draw the circuit of Binary weighted resistor Digital to analog Converter and Explain its operation 9. Reduce the following expression using Boolean Algebra laws
   a. A'B'C'+ A'B'C + AB'C' + ABC
   b. [(A+B)' + C]' (4)
   ii.Realizethe given expression using only NAND gates and inverters XYZ + X'Y'Z' (4)
   iii.Design a full adder, constructs the truth table, simplify the output equations and draw the logic diagram (8)

UNIT V
Communication Engineering

PART-A

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 singal

4. Define modulation?

- Modulation is the process of changing some parameters of a high frequency carrier signal in according 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 modution
- 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

9.Define modulation lined in case of FH.

- m=s/fm=maximum frequency deviation/modulation frequency

10.what is Radio communication?

- Radio communication is transmission of speech,music,entertainment programmer.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 advantages of microwave communication.

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

16.List few applications of microwaves communication.

- 1.Terrestial microwave links are used to carry telephony,data and T.V signals.
- 2.Satellite communication uses microwave frequencies for their oprerations.

- 3.microwave radiation has aiso found some medical applications for heatig tumours.
- 4.Microwave can be used for material cutting.

17.Based on coverage classify the orbits.

- Polar orbits
- 2.Inclined orbit
- 3.Equatorial orbit

PART B

1. (i) Show and discuss the block diagram of radio broadcasting and reception system and explain the function of each block. (10)
   (ii) Demonstrate on optical fiber communication (6)
2. (i)Illustrate the circuit diagram of balanced modulator and explain its operation. (8)

(ii) With a neat block diagram explain the principle of operation of FAX. (8)

3. Discuss any one method for suppressing the unwanted sideband. Support your answer with the required diagrams. (16)
4. Summarize the principle of Amplitude & Frequency Modulation and its need. (16)
5. Conclude the usage of satellite for long distance communication with a neat block diagram basic satellite transponder. (16)
6. Describe in detail with the necessary diagram the microwave and satellite communication system. (16)
7. Explain in detail the functional diagram of Monochrome TV transmitter and receiver. (16)
8. (i)Point out a Typical Television video signal, Explain how this is converted to image on TV screen 10

(ii). A 10MHz sinusoidal carrier wave of amplitude 10mV is modulated by a 5KHz sinusoidal audio signal wave of amplitude 6mV. Design and find the frequency components of the resultant

modulated wave and their amplitudes.

(6)

9. Describe with suitable diagram Diode detector for AM signals. (16)

10. Label and explain the radio broadcasting and reception system. (16)