CHAPTER-01

1. **Energy is the ability to do work.**
2. **The symbol for energy is *W.***
3. **Electricity is the form of energy.**
4. **Work equals force times distance.**
5. **The joule is the base unit of energy.**
6. **The joule is the base unit of work.**
7. **The symbol for the joule is J.**
8. **Under ordinary condition energy is neither created nor destroyed.**
9. **All matter is made up of atoms.**
10. **Hydrogen has only one electron and one proton. All other atoms contain electrons, protons, and neutrons.**
11. **Protons and neutrons are found in the nucleus of the atom.**
12. **Electrons have a negative electric charge.**
13. **Protons have positive electric charge.**
14. **Neutrons do not have an electric charge.**
15. **Atom have an equal no. Of proton and electron.**
16. **Valence electrons are found in the outer most shell of the atom.**
17. **A negative charge means an excess of electron.**
18. **Electric charge as the electrical property possessed by electron and proton...**

CHAPTER-02

1. **Charge is the electrical property of electron and protons.**
2. **One coulomb(C) is the charge possessed by 6.25×10^{18} electrons.**
3. **Current is the movement of charge in a specified direction.**
4. **Current can flow solid, gases, liquids, and a vacuum.**
5. **In solid current carriers is electron.**
6. **In gases current carriers are both electron and ions.**
7. **In liquids the current carriers are ions both positive and negative.**
8. **Current travels at approximately the speed of light.**
9. **Individual current carriers (electron) travel much slower than the speed of light.**
10. **Direct current (dc) never reverses direction.**

11. **Alternating current (ac) periodically reverses direction.**
12. **A liquid containing ion is an electrolyte.**
13. **An ampere (A) is a one coulomb per second (C/sec.)**
14. **Voltage is the potential energy difference between two points.**
15. **Energy =voltage × charge**
16. **Polarity indicates whether a point is negative or positive.**
17. **Sources of voltage include generators, batteries, thermocouples, solar cells, and crystals.**
18. **Resistance opposes to flow of current.**
19. **Resistance convert electric energy to heat energy.**
20. **Conductors are materials that have low resistance.**
21. **Silver, copper, and aluminium (in that order) are the best conductors.**
22. **Insulators do not allow any current to flow(for practical purpose).**
23. **An ohm (Ω) is 1 volt per ampere (V/A). It is the resistance of a specified column of mercury at a specified temperature.**
24. **Most conductors have a positive temperature coefficient.**
25. **A temperature coefficient of resistance specifies the number of ohm of change per million ohms per degree Celsius (abbreviation ppm/˚C)**
26. **Resistivity (specific resistance) of a material is the resistance of a specified-size cube of material.**
27. **Power is the rate of doing work or converting energy.**
28. **A watt (W) is 1 joule per second (J/sec.).**
29. **Energy = power × time**
30. **A kilowatt hour is unit of energy.**
31. **Horsepower is a unit of power.**
32. **1 horse power(hp) = 746 watts**
33. **Volt = joule per coulomb.**
34. **Current = coulomb per sec.**
35. **Ammeters are easily damaged by incorrect connections to a circuit.**

CHAPTER-03

1. Cells are energy or power sources.
2. Cells provide dc voltage.
3. A cell contains an electrolyte and two electrodes.
4. A battery is made from two or more cells.
5. Primary cells are not rechargeable.
6. Secondary cells are rechargeable.
7. Dry cells may use either a paste or a liquid electrolyte.
8. Gases are produced when cells are charged or discharged.
9. The energy available from a battery is dependent on temperature, rate of discharge and final voltage.
10. The energy storage capacity of a cell or battery is expressed in ampere-hours.
11. Internal resistance causes a cells voltage to decrease as the current increases.
12. Common secondary cells are lead-acid, nickel-cadmium, and rechargeable alkaline.
13. Common primary cells are carbon-zinc, alkaline, mercury and silver oxide.
14. When lead-acid cell is discharging, sulphuric acid is being converted to water.
15. Carbon-zinc cells are relatively inexpensive.
16. Alkaline cells store more energy than carbon-zinc cell. The former are more efficient at high current drains.
17. Both mercury and silver oxide cells have nearly constant output voltage.
18. Incandescent miniature lamps have tungsten filaments.
19. Miniature lamps have both a current and voltage rating.
20. Bimetallic strips bend because the two metals have different coefficient of expansion.
21. The resistance of lamp when hot is greater than its resistance when cold.
22. Only one electrode glows when a neon lamp is operated on direct current.
23. A neon lamp circuit must have a resistor to limit the current through the lamp.

24. **Potentiometer is variable resistor.**
25. **The power rating of resistor independent of its resistance.**
26. **A potentiometer can also be used as rheostat.**
27. **Thermistors have high temperature coefficients.**
28. **Switches have both a current and voltage rating.**
29. **Cable are multiple conductor.**
30. **Wires are single conductors.**
31. **The American wire gage (AWG) is the standard used to specify the size of a conductor.**
32. **Insulation used on conductor has both a temperature and a voltage.**
33. **Circuit –breaker mechanisms work on either a magnetic or a thermal principle.**
34. **Fuses are thermally operated devices.**
35. **A blown fuse results in an circuit .**
36. **Instrument(fast-blown) fuses are used to protect electric meters.**
37. **Fuses and breakers have both current and voltage rating.**
38. **multiple –load circuit include series , parallel ,and series –parallel circuits.**
39. **Series circuit are single –path circuits.**
40. **The same current flows throughout a series circuit.**
41. **The total resistances equels the sum of the individual resistance in a series circuit .**
42. **The sum of the voltage drops around a circuit equals the total source voltage (kvl).**
43. **A voltage drop (voltage across a load) indicates that electric energy is being converted to another form.**
44. **The polarity of a voltage drop indicates the direction of current flow.**
45. **The voltage across an open series load is equal to the source voltage.**
46. **A shorted load in a series circuit increases the current , voltage ,and power of the other loads.**
47. **When one resistance in a series circuit is smaller than the tolerance of another ,the smaller resistance has little effect on the circuit current and power.**
48. **The highest resistance in a series circuit drop the most voltage .**
49. **Maximum power transfer occurs when the source resistance equals the load resistance.**

50. **Conductance is the ability to conduct current.**
51. **Parallel circuit are multiple-path circuits.**
52. **Each branch of a parallel circuit is independent of the other branches.**
53. **The same voltage appears across each branch of a parallel circuit.**
54. **The current entering a junction must equal the current leaving a junction (kcl).**
55. **The total current in a parallel circuit equals the sum of the branch currents.**
56. **Adding more resistance in parallel decreases the total resistance.**
57. **The total resistance in a parallel circuit is always less than the lowest branch resistance.**
58. **The relationships of both series and parallel circuit are applicable to parts of series-parallel circuits.**
59. **Complex circuit (network) cannot be analyzed using only series-parallel rules and procedures.**
60. **Equation with more than one variable can be solved by simultaneous equation, techniques.**
61. **To solve simultaneous equation ,there must be as many independent equations as there are unknown variables.**
62. **Loop equations are derived by applying kirchhoff's voltage law to each loop of a circuit.**
63. **The loop – equations technique can solve for all voltage and current in a circuit.**
64. **The loop –equations technique can be applied to either single –source or multiple source circuits.**
65. **When the calculated value of current has a negative sign , the direction of current originally assumed is incorrect.**
66. **The superposition theorem can be used to analyze complex multiple source circuits without using simultaneous equations.this technique can solve for all current and voltages in the circuit.**
67. **When the superposition theorem is used ,all but one voltage source is replaced by its internal resistance.**
68. **In many circuit the internal resistance of the voltage source can be assumed to be 0 ohm, that is, the voltage source can be viewed as a constant (ideal) voltage source.**
69. **An equivalent –circuit voltage source consist of a constant voltage source (Voc or Vth)in series with an internal resistance (Rs or Rth).**

70. **If an electric is viewed as a two terminal network , thevenin's theorem provide a way of reducing the circuit to an equivelant –circuit voltage source.**

71. **Thevenin's theorem can be used to find the current and voltage associated with a single resistor in a complex circuit.**

72. **A constant current source assumes that current from the terminals of source remains the same for all values of load resistance.furthermore ,the constant current source is assumed to have an infinite internal resistance.**

73. **An equivalent –circuit current source is a constant current source (Isc) in parallel with an internal resistanc e(Rs).**

74. **For a given circuit, the internal resistances of the equivalent-circuit current source and the equivalent-circuit voltage source are the same.**

75. **In a circuit, Isc =Voc/Rs and Voc = IscRs;therefore, In =Vth/Rth and Vth = InRn.**

76. **Norton's theorem provides a way of reducing any two –terminal circuit to an equivalent-circuit current source.**

77. **Norton's theorem can be used to determine the voltage across and the current through an individual resistor in a complex circuit.**

78. **Neither thevenin's nor norton's theorem always leads to the easy solution of all voltage and current in a circuit.**

79. **Either thevenin's or norton's theorem can lead to easy determination of Irl and Vrl when value of Rl is changed.**

CHAPTER-7

1. **Magnetism is an invisible force field.**

2. **A magnetic field exists around a magnet.**

3. **The line of force of a magnetic field are called magnetic flux.**

4. **The denser the flux , the stronger the magnetic field.**

5. **The magnetic field is strongest at the poles of a magnet.**

6. **The direction of flux is from the north poles to the south pole.**

7. **Like magnetic poles repel; unlike poles attract.**

8. **When magnetic poles attract each other , their flux lines oin together.**

9. **Line of flux are continuous loops.**

10. **Magnetic field exist around all current-carrying conductors.**

11. **The magnetic field around a straight conductor has no poles.**
12. **The left-hand rule is used to determine the direction of flux around a conductor.**
13. **The strength of the magnetic field around a conductor is directly proportional to the current in the conductor.**
14. **Two parallel conductor attract each other if their current are in the same direction.they repel if the current are in opposite directions.**
15. **A coil of wire carrying a current forms magnetic poles.**
16. **The north pole of a coil can be determined by use of the left-hand rule.**
17. **Decreasing the space between turns of a coil increases the flux at the poles of a coil.**
18. **Iron ,nickel,and cobalt are all magnetic materials.**
19. **Iron isthe most manetic of the elements.**
20. **Nonmagnetic materials do not prohibit flux from passing through them.**
21. **The domains of a permanent magnet remain aligned after the magnet is removed from the magnetizing field.**
22. **Magnetic materials are magnetized when put in the field of other magnets.**
23. **Magnetomotive force can be increased by increasing the current or the turns in a coil.**
24. **When a material is saturated , increasing the mmf does not increase the flux.**
25. **Residual magnetism refers to the flux that remains in a temporary magnet after it is removed from a magnetic field.**
26. **Reluctance is the opposition to magnetic flux .**
27. **Magnetic material have less reluctance than nonmagnetic materials.**
28. **A changing magnetic flux can induce a voltage in a conductor.**
29. **The ampere –turn is the base unit of mmf.**
30. **The base unit of magnetic flux is the webr(wb).**
31. **The base unit of magnetic field strength (H) is the ampere-turn per meter(A.t/m).**
32. **Magnetic field strength is also known as field intensity and magnetizing force.**
33. **Flux density (B) is the flux per unit cross –sectional abrea of a magnetic material.**
34. **Permeability refer to the ability of a material to pass r carry magnetic flux.it is equal to flux density divided by magnetic field strength.**

35. **Relative permeability is the ratio of the permeability of a material t the permeability of air.**

36. **The strength of an electromagnet is determined by the reluctance and permeability of the core and by the mmf.**

37. **the tesla(T)is the base unit of flux density. One tesla is one weber per square meter.**

38. **Direct-current motors rotate because of attraction and repulsion between the magnetic fields of the field poles and armature.**

39. **The plunger of a solenoid is made from a high-permeability material.**

40. **The pull of a solenoid depend on the mmf and on the reluctance of its magnetic circuit.**

41. **A relay is an electromagnetic switch.**

CHAPTER-8

1. **The great majority of electric energy is used in the form of alternating current and ac voltage .a sine wave is the most common waveform for altern ating current.**

2. **Alternating current periodically reverses the direction in which it flows.**

3. **Alternating current periodically or continuously changes magnitude.**

4. **A dc waveform never cross the zero reference line.**

5. **A cycle is that part of a periodic waveform which occurs without repeating itself.it is composed of two alternations ;a negative alternation and a positive alternation.**

6. **The period T is the time required to complete one cycle.**

7. **The frequency f is the rate at which cycles are produced .its base unit is the hertz , abbreviated Hz.**

8. **One hertz is equal to one cycle per second.**

9. **Power in north America is distributed at a frequency of 60 Hz.**

10. **Frequency and period are reciprocally related ; T=1/f f=1/T.**

11. **Unless otherwise indicated ,ac quantities are assumed to be in rms (effective) values.**

12. **Effective , or rms, values of alternating current produce the same heating effect as the same value of direct current.**

13. **A conductor rotating in a perfect circle at constant speed in a uniform magnetic field produces a sine wave.**

14. **There are 180 electrical degrees per alternation and 360 electrical degrees per cycle.**

15. **Generator voltage is determined by (I)speed of rotation , (2) number of turns in the coils, and (3) flux density.**

16. **Generator frequency is determined by (1) speed of rotation and (2) number of pairs of magnetic pole:**
    F=r/min/60x pairs of poles.

17. **The magnitude of ac voltage is easier to change than the magnitude of dc voltage.**

18. **Electric power is usually transmitted from a power plant as three –phase alternating current.**

19. **The algebraic sum of the instantaneous phase values of three-phase voltage or current is always zero.**

20. **The voltage in a thre-phase system are separated by 120 electrical degrees.**

21. **In a delta connection, the line and phase relationships are Vline= Vphase , Iline = 1.732 Iphase.**

22. **In a wye connection, the line and phase relationships are Iline = Iphase , Vline =1.732 Vphase.**

1. The fourth wire in a four –wire system is the neutral wire. When the load on all three phase are equal (balanced) , the fourth wire carries no current.

2. The advantages of three-phase alternating current over single-phase alternating current are (1)more efficient transfer of power , (2) more constant load on the generator,(3) more constant torque from motors, (4) less fluctuation when rectified to direct current.

CHAPTER -9

1. In a pure resistance circuit, current and voltage are in phase.
2. When I and V are in phase , P =IV.
3. Reactance causes current and voltage to be 90 degree out of phase.
4. Circuit with inductive reactance cause current to lag voltage.
5. Circuits with capacitive reactance cause current to lead voltage.
6. A phasor represents the magnitude and direction of a quantity.
7. A single phasor can be broken into two smaller phasors which are at right angles to each other.
8. Only the resistive part of a current or a voltage can use power (convert electric energy).
9. The cosine of the angle is the ratio of the adjacent side to the hypotenuse.
10. The cosine of thita can be the ratio of the resistive current to the total current.
11. Cosine of thita can be the ratio of the resistive voltage to the total voltage.
12. In any electric circuit power can be calculated with the formula P= IV COS8.
13. Apparent power does not take into account the phase relationship between current and voltage.
14. The unit for apparent power is the voltampere (VA).
15. The ratio of poer to apparent power is equaln to cos8. It is also to the power factor.
16. Power factor varies from 0 to 1 or from 0 to 100 %.
17. Energy used at a low power factor is more costly than the same energy used at a high power facto

CHAPTOR-10

1. **Capacitance is the ability to store electric energy.**
2. **The symbol of capacitance is C.**
3. **Capacitors are devices constructed to provide specific amounts of capacitance.**
4. **Capacitors have two plates and a dielectric.**
5. **A charged capacitor stores energy and creates a voltage between its plates.**
6. **A charged capacitor can provide energy for other parts of an electric circuit.**
7. **Current does not flow through the dielectric material.**
8. **The farad is the base unit of capacitance.**
9. **The abbreviation for farad is F.**
10. **Capacitance is determine by plate area, distance between plates ,dielectric material and temperature.**
11. **Capacitors are named after their dielectric material, enclosure, construction process, or intended use.**
12. **Electrolytic capacitors are usually polarized. They have maximum capacitance for their size and weight.**
13. **Typical paper and film capacitances are less than 1 microF.**
14. **Ceramic and mica capacitor are limited to low value.**
15. **Energy- storage capacitor can provide very high power levels.**
16. **The curved line on a capacitor symbol identifies a specific plate on variable, polarized, paper, and film capacitors.**
17. **Except for an initial charging surge, capacitors block direct current.**
18. **The smaller of two series capacitors develops the greater voltage.**
19. **Capacitors control current flow in an ac circuit.**
20. **Current lead voltage by 90* in an ideal capacitor.**
21. **Capacitance uses no power or energy.**
22. **Energy loss in a capacitor results from dielectric and resistance losses.**

23. **Dissipation factor , power factor , and quality all are ways of rating a capacitor's relative energy loss.**

24. **Capacitive reactance is the opposition of a capacitor to sinusoidal alternating current.**

25. **The symbol for capacitive reactance is Xc.**

26. **Capacitive reactance is inversely proportional to both frequency and capacitance.**

27. **The total capacitance of series capacitors is less than the smallest capacitance.**

28. **The total reactance of series capacitors is the sum of the individual reactance.**

29. **The total capacitance of parallel capacitor is the individual capacitance.**

30. **Reactances of parallel capacitor are added reciprocally.**

31. **Ohm's law and kirchhoff's laws apply to capacitor circuits.**

32. **A time constant define the rate at which a capacitor charges or discharges through a resistor.**

33. **The capacitor formulas are C= Q/V W =0.5CV2 Xc = 1/6.28Fc T =RC**

CHAPTER-11

1. **Inductance opposes changes in current.**

2. **Inductance results from induced voltage.**

3. **Inductors are devices which provide inductance. Chokes ,coils, and reactors are other names for inductors.**

4. **The symbol for inductance is L.**

5. **The induced voltage in an inductor is known as counter electromotive force or back electromotive force.**

6. **Lenz's law is concerned with the polarity of an induced voltage.**

7. **A cemf opposes the change that created it.**

8. **Inductors convert energy back and between the magnetic form and the electrical form.**

9. **The henry is the base unit of inductance. The abbreviation for henry is H.**

10. **INDUCTANCE IS DETERMINED BY (1) core material, (2) number of turns, (3) spacing of turns, and (4) diameter of turns.**

11. **Inductors are rated for inductance , dc resistance , current , voltage , quality , and tolerance.**
12. **The dc resistance of an inductor is also called ohmic resistance.**
13. **The dc resistance of an inductor is also called ohmic resistance.**
14. **The quality Q of inductors ranges from less than 10 to more than 200: Q = XL/R.**
15. **Current in a dc inductive circuit rises more slowly than in a dc resistive circuit.**
16. **In a dc inductive circuit , voltage reaches its peak value before the current does.**
17. **Inductive kick causes arcing in switch contacts when an inductive circuit is opened.**
18. **Inductive reactance is the opposition of an inductor to alternating current.**
19. **The symbol for inductive reactance is XL.**
20. **Inductive reactance is directaly proportion al to both frequency and inductance: XL =6.28fL.**
21. **Ohm's law can be used in inductive circuits by replacing R with XL.**
22. **In an inductive circuit , current lags voltage by 90*.**
23. **Ideal inductors use no power or energy.**
24. **Real inductors have resistance; therefore, they do use some power.**
25. **Impedance is the combined opposition of reactance and resistance.**
26. **The skin effect increases the effective resistance of a conductor at high frequencies.**
27. **Litz wire is multistrand wire designed to reduce the skin effect.**
28. **Core losses are caused by induced currents in the core and by periodic reversal of the magnetic field.**
29. **Inductors (and inductive reactances) in parallel behave like resistors in parallel. The same formulas are used except that R is replaced by L or XL.**
30. **Inductors (and inductive reactances) in series behave like resistor in series.**
31. **The lowest series inductance drops the least voltage.**
32. **Mutual inductance can be reduced by axis orientation , physical separation ,and shielding.**
33. **Time constant formula : T = L/R .**
34. **Undesired inductance occurs in conductors and resistors.**

CHAPTER-12

1. Transformers operate on the principle of mutual inductance.
2. Mutual inductance is measured in henrys.
3. Magnetic flux links, or couples, the two coils of a transformer.
4. Primaries receive power , secondaries deiver power.
5. Primaries and secondaries , except on autotransformer , are electrically isolated.
6. Primaries and secondaries are reversible.
7. The coefficient of coupling specifies what portion of the primary flux link with the secondary.
8. The coefficient of coupling ranges from 0 to 1. It is greatest with iron core transformers.
9. Flux leakage refers to primary flux that does not couple to the secondary.
10. Turns ratio and voltage ratio are the same when the coupling is 100 %.
11. The turns per volt. Ratio is the same in all winding of a transformer.
12. One of the measure usases of transformers is to step up and step down voltages in a power transmission and distribution system .
13. When voltage is stepped down , current is stepped up.
14. When voltage is stepped up , current is stepped down.
15. Transformer losses occur in both the core and the coils.
16. % eff. = Psec/Ppri *100.
17. Transformer loss consist of hysteresis, eddy ,copper loss.
18. Copper loss is called I2R.
19. Core loss consists of hysteresis and eddy current loss.
20. Hysteresis loss results from residual magnetism.
21. Hysteresis loss increases with increased frequency.
22. Eddy currents are currents induced in the core by primary flux.
23. Eddy currents are reduced by using lamination and oxidiging or coating the surface of the lamination with an insulating material.

24. **An unloaded transformer behaves just like an inductor. The energizing current and supply voltage are nearly 90* out of phase. In the unloaded condition , the input power is dissipated in the form of copper and core losses.**
25. **Energizing current is the current drawn by the primary when the transformer is unloaded. Its magnitude is controlled by the reactance of the primary.**
26. **A fully loaded transformer appears to be almost entirely resistive to the source.**
27. **Power factor(cos*)approaches a value of one with a fully loaded transformer.**
28. **A secondary current increases , so does primary current.**
29. **Laminated core transformer are used at power and audio frequency.**
30. **Powdered iron and ferrite force are used in the audio frequency and lower radio frequency ranges.**
31. **Air core transformer are used only in the radio frequency range . their coupling can be controlled by the spacing and axis orientation of the coils.**
32. **Constant voltage transformers provide a stable secondary voltage.**
33. **Isolation transformer have equel primary and secondary voltage.**
34. **Isolation transformer help protect the service technician from receiving a shock through the chassis of electrical equipment.**
35. **Autotransformers use a common primary secondary winding. They are often used as variable transformers at power frequencies.**
36. **Matched impedances provide maximum power transfer.**
37. **Transformer may have voltage , current , power , and voltampere ratings.**
38. **Transformer power ratings applied to resistive loads only.**
39. **Power and voltampere ratings refer to the total of all secondaries.**
40. **Connecting windings in parallel increases the available current but does nt change the voltage rating.**
41. **Connecting winding in series ether increases or decreases the available voltage but does not increase the current ratings.**
42. **Parallel winding most be properly phased and have identical voltages.**
43. **Three single hase transformer can be used to transform three phase voltage.**
44. **Three phase transformer winding can be connected in either delta or wye configuration.**

45. **The primary and secondary of a three phase transformer need not be connected in the same configuration.**

CHAPTER-13

1. **Impedance is a combination of resistance and reactance.**

2. **Impedance causes phase shift.**

3. **Impedance may cause either a leading or a lagging current.**

4. **The symbol for impedance is Z.**

5. **The ohm is the base unit of impedance.**

6. **In RC circuit s, the current lead the voltage.**

7. **For series RC circuits, the following generalization can be made.**

a. **The total impedance is higher than either R or Xc.**

b. **The aritimetic sum of R and Xc is greater than Z.**

c. **Decreasing either *f* or C causes Z to increase, I to decrease, P to decrease, and Θ to increase.**

8. **The formulas that are applicable to all circuit involving combination of R,C, and L are.**

9. **THE FORMULA THAT IS APPLICABLE TO ALL SERIES circuit using combination of R, C, and L is cos*= R/Z =Vr/Vt.**

10. **The formula that applies to all parallel circuits using combinations of R, C, and L is cos* = Ir/ It.**

11. **The following are characteristics of parallel RC circuits: a. The total impedance is less than R or Xc. B. Decreasing either *f* or C causes Z to increase. I to decrease. And Θ to decrease. The power remains the same.**

12. **The current phasor is the reference phasor for series circuits.**

13. **The voltage phasor is the reference phasor for parallel circuits.**

14. **Resistance and reactance are 90® out of phase.**

15. **In all RL circuit, the current lags the voltage.**

16. **A series RL circuit has more Z than either R or $X_{L.}$**

17. **A series RL circuit has more V_t than either V_R or $X_{L..}$.**

18. **A parallel RL circuit has less Z than either R or X_L.**
19. **A parallel RL circuit has more I_T than either I_R or I_L.**
20. **In a series RCL circuit, Z may be either less or more than X_L or X_C.**
21. **In a reactant RCL circuit, Z is equal to R.**
22. **In RCL circuits, reactive voltages and curenan be greater than the total current or voltage.**
23. **A series RCL circuit having X_L greater than Xc is inductive.**
24. **A parallel RCL circuit having X_L greater than Xc is capacitive.**
25. **The formulas used only for series RCL circuits are .**
26. **The formula used only for parallel RCL circuit is I_T = root $(I_L - I_c)^2 + I_R^2$.**
27. **Resonance occurs $X_L = X_c$.**
28. **Increasing either L or C decreases tghe resonant frequency of an LC circuit.**
29. **A given L and C can produce only one resonant frequency.**
30. **For practical purposes, the quality of a resonant LC circuit is determined by the quality of the inductor.**
31. **All resonant circuit have a power factor (cosϴ) of 1.**
32. **The impedance of a series resonant circuit approaches zero.**
33. **The impedance of a parallel resonant circuit approaches infinity.**
34. **A parallel LC circuit operating above its resonant frequency is capacitive.**
35. **A seriesLC circuit operating above its resonant frequency is inductive.**
36. **The higher the quality of a circuit, the narrower its bandwidth.**
37. **The narrower the bandwidth of a circuit, the more selective the circuit is.**
38. **The bandwidth of a circuit is equal to f_r/Q.**
39. **Either RC or RL circuits can be used for high-pass and low-pass filters.**

CHAPTER-14

1. Motors can be classified by the type of power required or by the intended use.
2. Motors are available in sfhp, fhp, and ihp sizes.
3. Motors are rated for voltage, current, power, temperature, frequency, torque, duty cycle, service factor, and efficiency.
4. The national electrical manufactures as sociation (NEMA) establishes standards for motor ratings, enclosures, and frame sizes.
5. The voltage rating for tolerance of a motor is typically +_ 10% while the tolerance for frequency is usually +_ 5%.
6. Both voltage source variation and line voltage drops must be of concern when determining the appropriate voltage rating for a motor.
7. If possible, a motor should be operated on the positive side of its voltage tolerance rather than on the negative side.
8. The locked rotor current is many times larger than the full load current .
9. A motor with a SF greater than 1.0 can be operated its rated HP or under specified condition.
10. Ambient temp. For motor design purpose is usually considered to be 40 ®C.

CHAPTER-15

1. The d' Arsonval meter movement is commonly used in voltmeter, ammeter, and ohmmeters. It responds only to direct current. It is used in rectifier type instrument to measure alternating current and voltage.
2. Electrodynamometer meter movements use stationary and moving coils to develop interacting magnetic fields. They respond to alternating or direct current and are used in wattmeters. Electrodynamometer meters have low sensitivity and high accuracy.
3. A rectifier allows current to flow in only one direction. It converts alternating current to pulsating direct current.
4. Digital voltmeters measure the time required for a capacitor to charge to the value of the unknown voltage.
5. The iron-vane meter movement has no moving coil or permanent magnet.
6. The iron –vane meter movement responds to both alternating and direct current. It has a nonlinear scale and low sensitivity.
7. Basic meter movements are rated for voltage, current, and resistance.
8. Shunts and multipliers can be used with d'Arsonval, rectifiers-type, iron-vane, and electrodynamometer meter.
9. Values for shunts and multipliers can be calculated if the meter-movement ratings and the ranges are known.
10. Ammeters have very low internal resistance.
11. Voltmeters have very high internal resistance.
12. External shunts are rated in amperes and millivolts .
13. Shunts and multipliers are precision resistors having a low temperature coefficient.

14. **Shunts are in parallel with the meter movement. They extend the range of ammeters.**

15. **Multipliers are in series with the meter movement. They extend the range of voltmeters.**
16. **Current transformers are used to extend the range of ammeters.**

17. **Clamp-on ammeters can measure current in an circuit without interrupting the circuit.**
18. **Thermocouple meters are used to measure high-frequency current. They use a d'Arsonval meter movement.**
19. **VOMs have an ohms-per –volt rating. This rating is also called the VOM's sensitivity.**
20. **Input resistance =sensitivity x range**
21. **Ohms per volt = 1/full-scale current.**
22. **DMMs have an input-resistance rating which is independent of the range.**
23. **Meter loading causes changes in circuit currents and voltages when measurements are made.**
24. **Ohmmeters have a power source, rheostat, meter movement, and fixed resistor.**
25. **Ohmmeter scales are nonlinear and often reverse-reading.**
26. **Ohmmeter ranges are charged by switching voltages or shunts.**
27. **Insulation testers (Meggers®) use high voltages to measure very high resistances (insulation).**
28. **Wheatstone bridges use a galvanometer which indicates zero when a bridge is balanced.**
29. **a bridge is balanced when the ratio of rheostat to unknown resistance equals the ratio of the two known resistor.**
30. **The accuracy of a bridge is determined by the tolerances of the resistors used in it.**
31. **In a wattmeter the moving coil responds to voltage and the stationary coil responds to current.**
32. **Wattmeters are polarized instruments. They indicate true power. They have current, voltage, and power ratings.**
33. **A single wattmeter can measure power in a balanced three-phase load.**
34. **Two wattmeters are required to measure power in an unbalanced three-phase load. The wattmeter readings are algebraically added.**
35. **A vibrating- reed meter measures only a narrow range of frequencies.**
36. **Impedance can be measured by the current voltage method or by the equivalent-resistance method.**
37. **Inductance and capacitance can be measured by the digital method or by the ac-bridge method.**
38. **The digital inductance meter measures the cemf of inductor.**
39. **The digital capacitor meter measures the time required to change the capacitor.**