LESSON 1
ELECTROSTATICS

1. The ratio of forces between two point charges in air and in a medium of dielectric constant 5 is
   a) 1:1           b) 1:5           c) 5:1           d) 1:25

2. If the magnitude of each charge is increased by two times and the distance between them is doubled then the electrostatic force between them is
   a) doubled       b) quadrupled    c) remains same    d) halved

3. The electric field due to a point charge at its own location is
   a) zero             b) unity        c) infinity      d) none of the above

4. The product of the number of lines of force generated by a unit positive charge in free space and the permittivity of free space is
   a) zero       b) unity           c) \( \varepsilon_0 \)        d) infinity

5. An electric dipole has maximum potential energy when it is rotated in an uniform electric field by an angle \( \theta \) equal to
   a) 0°          b) 45°            c) 90°            d) 180°

6. The potential of earth is
   a) infinite      b) zero        c) small          d) large

7. The potential of a dipole along its equatorial line at 2 m distance from the centre is
   a) zero        b) positive       c) negative      d) non-zero

8. If a proton is moved against the coulomb force of an electric field
   a) work is done by the electric field   b) energy is used form outside source
      c) the strength of the field is decreased d) the energy of the system is decreased

9. Capacitor stores
   a) Magnetic energy  b) Chemical energy  c) Electrical energy  d) Heat energy

10. The effective capacitance of two capacitors each of 4\( \mu F \) capacitance joined in Parallel is
    a) 2\( \mu F \)   b) 4\( \mu F \)  c) 6\( \mu F \)  d) 8\( \mu F \)

11. The capacitance of a parallel plate capacitor is 2\( \mu F \). If the area of the plates is doubled and the distance is halved then the capacitance of the condenser is
    a) 1\( \mu F \)  b) 2\( \mu F \)  c) 6\( \mu F \)  d) 8\( \mu F \)

12. n capacitors of equal capacitance are first connected in series and then in parallel. The ratio of effective capacitance in series to parallel is
    a) 1 : n    b) 1 : n\(^2\)   c) n\(^2\) : 1    d) n : 1

13. The capacitance of three capacitors are in the ratio 1 : 2 : 3. The equivalent capacitance when connected in parallel is greater than that when they are connected in series by \( \frac{6}{0} \) \( \mu F \). Then the individual capacitances in (\( \mu F \)) are
    a) 4, 8 and 12   b) 3, 6 and 9   c) 2, 4 and 6    d) 1, 2 and 3

14. What is the effective capacitance between the points X and Y

15. If $n$ capacitors each of capacitance $C$ are connected in series with a battery of $V$ volt. Then the energy stored in all the capacitors will be

a) $nCV^2$  
b) $\frac{1}{2} nCV^2$  
c) $\frac{1}{8} nCV$  
d) $\frac{1}{2n} CV^2$

16. When a number of capacitors of equal capacitances are connected in series, the effective capacitance is $0.4 \mu F$ and when they are connected in parallel the effective capacitance is $90 \mu F$. What is the capacitance of each capacitor?

a) 3 $\mu F$  
b) 6 $\mu F$  
c) 9 $\mu F$  
d) 12 $\mu F$

17. The capacitance of a capacitor that should be connected along with 2 capacitors having capacitances $8 \mu F$ and $4 \mu F$ all in series to produce effective capacitance of $\frac{24}{11} \mu F$ is

a) $4 \mu F$  
b) $8 \mu F$  
c) $12 \mu F$  
d) $16 \mu F$

18. Two identical metals spheres have charges $+15 \text{ mc}$ and $+25 \text{ mc}$ and are separated by a distance. If they are first brought in contact and then separated to the original distance, then the ratio of the new force between them to the previous force is

a) $16 : 15$  
b) $15 : 16$  
c) $5 : 4$  
d) $4 : 5$

19. Two charges $+4 \mu C$ and $-1 \mu C$ are placed at a distance 1 m apart. The distance of the points on the line joining the charges and from the charge $-1 \mu C$ where the resultant electric field is zero is

a) 1 m  
b) 2 m  
c) 1.5 m  
d) 1.25 m

20. Two charges $+4 \text{ C}$ and $+16 \text{ C}$ are separated by a distance of 3 m. To keep these charges in equilibrium, a third charge is to be placed at

a) 1 m from the charge 4C  
b) 1 m from the charge 1C  
c) 1.5 m from the charge 1 C  
d) 1.5 m from the charge 4C

21. Two charges $-q$ and $+2q$ are placed at A and B respectively. Let $AB = d$. At a point P between A and B, the potential is zero. Then the distance AP is

a) $d$  
b) $-\frac{d}{2}$  
c) $\frac{d}{3}$  
d) $\frac{d}{4}$

22. Three charges each of $1 \mu C$ are placed at the corners of an equilateral triangle. If the force between any two charge be $F$, then the net force on each charge is,

a) $F$  
b) $2F$  
c) $\sqrt{2} F$  
d) $\sqrt{3}F$

23. Three charges $+q$, $-q$ and $+q$ are placed at the corners A, B and C respectively of an equilateral triangle ABC. What is the direction of the total force on the charge at C?

a) Along CA  
b) Along CX, which is parallel to AB  
c) Along CB  
d) Along CY, which make an angle of 150° with CA

24. A square of side $\sqrt{2}$ m has charges of +2 nc, +1nc, -2nc and -2nc respectively at its corners. The resultant potential at the centre of the square is

a) $+9V$  
b) $-9V$  
c) $+18V$  
d) $-18V$

25. The electric potential $V$ at a point distance $r$ m from a charge is given by $V = \frac{16}{r}$ volt. What is the electric field intensity at $r = 4$ m?

a) $0.5V/m$  
b) $1V/m$  
c) $-5V/cm$  
d) $1V/cm$

26. Two wires of length 2 m and 4 m are charges to 6 mc and 12 mc respectively. If the wires are kept 2 m apart, the electric field becomes zero at
27. Electric potential energy of an electric dipole in an electric field is given as

a) PE Sin θ  

b) –PE Sinθ

c) –PE Cosθ

d) PE Cosθ

a) 1 m from each wire  
b) 1.5 m from first and .5m from second wire  
c) .5 m from first and 1.5m from second wire  
d) 2 m from the first wire
LESSON 2

CURRENT ELECTRICITY

1. The number of electrons flowing per second that makes a current of 4.8 A is
   a) \(3 \times 10^{18}\)  b) \(3 \times 10^{19}\)  c) \(6 \times 10^{18}\)  d) \(6 \times 10^{19}\)

2. Superconductors are mainly used to produce
   a) permanent magnetic fields  b) temporary magnetic fields
   c) electromagnetic fields  d) very strong magnetic fields

3. The reciprocal of the slope of the graph drawn between \(V\) and \(I\) for steady current in a conductor gives
   a) resistance  b) conductance  c) resistivity  d) conductivity

4. When a current of 5A flows through a resistance of 100 Ohm, the potential across the resistance is
   a) 5000 V  b) 500 V  c) 50 V  d) 20 V

5. The resistance of a conductor of length 1 m and area 2 m\(^2\) is \(r\). Then its conductivity is
   a) \(\frac{1}{r}\)  b) \(\frac{1}{2r}\)  c) 2 \(\frac{1}{r}\)  d) \(\frac{r}{2}\)

6. If the colour codes in a carbon resistor are red, red and black. Then the resistance of the resistor is
   a) 2.2 \(\Omega\)  b) 22 \(\Omega\)  c) 220 \(\Omega\)  d) 2.2 K \(\Omega\)

7. Three resistors of resistance \(R\) \(\Omega\) are connected in series. The effective resistance is
   \[
   R_1 = 5\Omega \quad R_2 = 3\Omega \quad R_3 = 2\Omega
   \]
   a) \(\frac{R}{3}\)  b) \(\frac{3}{R}\)  c) 3R  d) R

8. Calculate the potential difference across each resistor in the above circuit.
   a) 5V, 3V, 2V  b) 2V, 3V, 5V  c) 2V, 6V, 10V  d) 10V, 2V, 6V

9. n identical resistors are connected first in series and then in parallel. The ratio of their effective resistances is
   a) 1:n  b) n:1  c) 1:n\(^2\)  d) n\(^2\):1

10. If three resistors each of 2 \(\Omega\) are connected in the form of a triangle. The net resistance between any two corners is
    a) 2 \(\Omega\)  b) 6 \(\Omega\)  c) \(\frac{3}{4}\) \(\Omega\)  d) \(\frac{4}{3}\) \(\Omega\)

11. A cell of emf 2 V sends a current of 0.5 ampere through a resistance of 3 \(\Omega\). The internal resistance of the cell is
a) 0.6 Ω   b) 1 Ω   c) 2 Ω   d) 4 Ω
12. The value of current is the given circuit is

\[ \begin{align*}
&3.5A \\
&1.5A \\
&1.25A \\
&1.75A \\
&3.25A
\end{align*} \]

a) 1.25 A away from the junction  
b) 4.75 A towards the junction  
c) 5.25 A away from the junction  
d) 5.25 A towards the junction

13. The current in the given circuit is

\[ \begin{align*}
&2V \\
&8\Omega \\
&5V
\end{align*} \]

a) 0.3 A  
b) 0.6 A  
c) 1.5 A  
d) 3 A

14. The resistance in cyclic order of the four arms of wheatstone’s network at balance is

a) 8, 6, 16, 12  
b) 8, 6, 12, 16  
c) 6, 8, 12, 16  
d) 16, 6, 8, 12

15. An electric lamp labelled as 220 V, 60 W has a filament resistance of

a) 16.4 Ω  
b) 3.7 Ω  
c) 806.7 Ω  
d) 13 Ω

16. When a water heater of 2.5 KW operates on 100V it draws a current of

a) 25 A  
b) 12.5 A  
c) 1.25 A  
d) 2.5 A

17. The resistance of a conductor is 5 Ω at 50 °C and 6 Ω at 100°C. Then the resistance at 0°C is

a) 1 Ω  
b) 2 Ω  
c) 4 Ω  
d) 8 Ω

18. Resistance of a metal wire of length 10 cm is 2Ω. If the wire is stretched to 40 cm, the new resistance is

a) 6 Ω  
b) 16 Ω  
c) 32 Ω  
d) 64 Ω

19. In a potentiometer a cell of emf 1.5 V balances at a length of 200 cm. If another balances at 300 cm. For the same current, its emf will be

a) 1.5 V  
b) 2 V  
c) 2.25 V  
d) 2.5 V

20. In a conductor, the electric charge per unit volume is 1.5 mC. If the current density in it is 0.3 Am², then the drift velocity of the electrons is

a) 100 ms⁻¹  
b) 200 ms⁻¹  
c) 25 ms⁻¹  
d) .1 ms⁻¹

21. With an unknown resistance, the balancing length obtained in a meter bridge is 20 cm. When 9Ω resistance is connected in series, with the unknown resistance the balancing length changes to 50cm. Then the unknown resistance is

a) 2 Ω  
b) 6 Ω  
c) 3 Ω  
d) 8 Ω

22. A wire of resistance R is cut into n equal parts. These parts are then connected in parallel. The equivalent resistance of the combination

\[ \frac{R}{n} \]

\[ \frac{R}{n^3} \]

\[ \frac{n^2}{R} \]
a) nR  

b) —  

c) —  

d) —
23. Into how many equal parts it is necessary to cut a 81 Ω conductor so as to obtain a resistance of 1 Ω by connecting these parts in parallel?
   a) 20         b) 9         c) 81         d) 18

24. Two copper wires of length 4 m and 9 m are found to have the same resistance. Their radii are in the ratio.
   a) 1 : 9       b) 9 : 1       c) 2 : 3       d) 3 : 1

25. A resistance whose printed value is 2 Ω is observed to have an actual resistance 2.1Ω. What length of wire of resistance 21 Ω m⁻¹ must be connected in parallel with the coil in order that the combined resistance shall be exactly 2 Ω ?
   a) 0.5m       b) 1 m        c) 1.5 m      d) 2 m

26. Two coils have a combined resistance of 16Ω when connected in series and 4 Ω when connected in parallel. The resistances are
   a) 12Ω, 4Ω     b) 12Ω, 6Ω     c) 8Ω, 8Ω     d) 10Ω, 6Ω

27. The effective resistance between the points A and B is
   a) 1Ω        b) 1Ω        c) 2Ω        d) 4Ω

28. What is the strength of current that will deposit 1 gm of silver on cathode in silver voltameter during electrolysis in 7.5 minutes? (Z = 0.00118 gc⁻¹)
   a) 0.1 A       b) 0.2 A      c) 1.6A       d) 1.88 A

29. A silver and zinc voltmeters are connected in series and a current is passed through them for a time 1 sec, liberating 2 gms of zinc. Then the weight of silver deposited is nearly (E_{Ag} = 108 and E_{zn} = 31)
   a) 2 g        b) 4 g        c) 7g        d) 4.2 g

30. For obtaining chlorine by electrolysis, a current of 100 KW and 125 V is use. The amount of chlorine obtained in one minute will be (Z = 0.367 x 10⁻⁶ kgc⁻¹)
   a) 1.7616 gm    b) 17.616 gm   c) 0.176161kg  d) 1.7616 kg

31. Which of the following quantity is a scalar?
   a) drift velocity   b) Electro chemical equivalent
   c) mobility        d) current density

32. A bird sitting on an uninsulated wire carrying a current feels quit safe because,
   a) The bird is a non conductor of electricity.
   b) Resistance of the bird is very large.
   c) There is a large potential different bird and wire.
   d) There is no potential difference between bird and wire.

33. The specific resistance of a manganin wire of length 2 m and diameter 0.4 mm having a resistance of 70 Ω is
   a) 44 x 10⁻⁷Ωm     b) 44 x 10⁻⁵Ωm    c) 22 x 10⁻⁶Ωm     d) 11 x 10⁻⁵Ωm
The brown ring at one end of a carbon resistor indicates a tolerance of
a) 1%  b) 2%  c) 5%  d) 10%
LESSON 3

EFFECTS OF ELECTRIC CURRENT

1. Two resistance R and 2 R are connected in series in an electrical circuit. The ratio of heat produced in them is
   a) 1:1  
   b) 1:2  
   c) 2:1  
   d) 1:4

2. Power consumed by a lamp of resistance 11\(\Omega\) connected to a source of 220 V is
   a) 220 W 
   b) 440 W 
   c) 4.4 KW 
   d) 2.2 KW

3. Joules heating effect and Peltier effect are proportional to the
   a) Square of the current 
   b) current 
   c) Square and cube respectively of the current 
   d) Square and first power respectively of the current

4. A current of 2 A flows through a resistance of 10 \(\Omega\) for 5 minutes. Then the heat produced in the resistor is
   a) 12 KJ 
   b) 200 J 
   c) 6 KJ 
   d) 60J

5. Magnetic flux density at the centre of a circular coil of diameter 20 cm carrying a current of 5A kept in air is
   a) \(\pi \times 10^{-7} \text{T}\) 
   b) \(4 \pi \times 10^{-7} \text{T}\) 
   c) \(\pi \times 10^{-5} \text{T}\) 
   d) \(\pi \times 10^{-6} \text{T}\)

6. A current of 50 m A through the coil of a galvanometer rotates the coil through an angle of \(\frac{\pi}{10}\) radian. What is the galvanometer constant if there are 500 turns in the coil?
   a) \(\frac{500}{\pi} \text{ m A/rad}\) 
   b) \(\frac{1}{\pi} \text{ m A/rad}\) 
   c) \(\frac{\pi}{500} \text{ mA/rad}\) 
   d) \(\frac{50}{16} \text{ mA/rad}\)

7. The direction of magnetic field due to solenoid is given by
   a) Ampere’s rule 
   b) Right hand palm rule 
   c) End rule 
   d) Right hand cork screw rule

8. The temperature of inversion of a thermocouple is 570\(^\circ\)C, when the cold junction is at 20\(^\circ\)C. Then the neutral temperature is
   a) 275\(^\circ\)C 
   b) 295\(^\circ\)C 
   c) 285\(^\circ\)C 
   d) 255\(^\circ\)C

9. The force experienced by a current carrying conductor in a magnetic field is
   a) along the axis of the conductor 
   b) perpendicular to the conductor 
   c) in the direction of the current 
   d) opposite e to the direction of current

10. The minimum value of magnetic moment of orbital electron is
    a) one Bohr magneton 
    b) two Bohr magneton 
    c) three Bohr magneton 
    d) half Bohr magneton

11. The principal quantum number of an orbital electron that has magnetic moment of 4 magneton is
    a) 1 
    b) 2 
    c) 4 
    d) 6

12. Current is flowing through a conductor of resistance 10 \(\Omega\). In which of the following cases maximum heat will be generated.
    a) 5 ampere current passes for 2 minutes 
    b) 4 ampere current passes for 3 minutes 
    c) 3 ampere current passes for 6 minutes 
    d) 2 ampere current passes for 5 minutes
13. A current of 2 amperes produces a deflection of 30° in a tangent galvanometer. A deflection of 60° will be produced in it by a current of
   a) 6 A  b) 2A  c) \( \sqrt{3} \) A  d) \( \frac{1}{\sqrt{2}} \) A

14. A.T.G. shows a deflection of 45° when 10 mA current flows through it. If the horizontal component of earth’s magnetic field is 3.6 \( \times \) 10^{-5} T and the radius of the coil is 10 cm, then the number of turns in the coil is
   a) 573  b) 500  c) 600  d) 650

15. A galvanometer of resistance 60 ohms which can take a maximum current of .01 A is connected in a circuit carrying a current of 1 ampere. The minimum resistance of the shunt connected across the galvanometer is
   a) \( \frac{60}{99} \) Ohms  b) \( \frac{60}{100} \) Ohms  c) \( \frac{60}{2} \) Ohms  d) \( \frac{100}{60} \) Ohms

16. An \( \alpha \) particle enters a magnetic field of 1 Tesla with a velocity of \( 10^6 \) ms^{-1} in a direction perpendicular to the field. The force on \( \alpha \) particle
   a) 1.6 \( \times \) 10^{-13} N  b) 6.4 \( \times \) 10^{-3} N  c) 3.2 \( \times \) 10^{-13} N  d) 4.8 \( \times \) 10^{-12} N

17. A Solenoid is 3 m long and 4 cm in radius. It has 5 layers of windings of 500 turns each and carries a current of 5A. Find the magnetic induction at its centre along its axis.
   a) \( 0.5 \times 10^{-2} \) T  b) \( 2 \times 10^{-2} \) T  c) \( 5 \times 10^{-2} \) T  d) \( 200 \times 10^{-5} \) T

18. The magnetic field induction at a distance of 4 cm from a long current carrying wire is \( 10^{-3} \) T. The magnetic field induction at a distance of 12 cm from the same wire is
   a) \( 9 \times 10^{-3} \) T  b) \( 3 \times 10^{-3} \) T  c) \( 3.33 \times 10^{-4} \) T  d) \( 2.2 \times 10^{-4} \) T

19. A wire of length 1 m carrying a current of 2 A is placed inside a field of magnetic induction 20 T. Such that it makes an angle of 30° with the direction perpendicular to the field. The force experienced by the wire is
   a) 40 N  b) 20 N  c) \( 20 \sqrt{3} \) N  d) 10 \( \sqrt{3} \) N

20. Two concentric circles carry the same current in opposite directions. The diameter of the outer coil is twice as compared to the inner coil. If at its centre the smaller coil produces a magnetic field of 2 T, then the magnetic field at the common centre is
   a) 4T  b) 3T  c) 2T  d) 1T

21. A galvanometer has an internal resistance of 20Ω. It gives maximum deflection for a current of 30 mA. The resistance to be connected in series to convert it into a voltmeter of maximum reading 3 V is
   a) 40 Ω  b) 49 Ω  c) 22 Ω  d) 80 Ω

22. In a thermocouple the temperature of a cold junction is 20°C. The temperature of inversion is 600°C, then the neutral temperature is
   a) 310°C  b) 320°C  c) 300°C  d) 315°C

23. The unit of reduction factor in tangent galvanometer
   a) no unit  b) Tesla  c) Ampere  d) ampere / degree

24. The torque experienced by a rectangular current loop placed perpendicular to a uniform magnetic field is
   a) maximum  b) zero  c) finite minimum  d) infinity.

LESSON 4

Electromagnetic Induction and Alternating Current

1. A magnetic induction of 0.1 T, produces a flux of 0.5 Wb in a single turn coil of Area 10 m$^2$. Then the angle between the directions of magnetic induction and the plane of the coil is
   a) 0°          b) 30°          c) 60°          d) 90°

2. Henry is equivalent to
   a) $\frac{Volts}{Second}$          b) $\frac{Volt-ampere}{Second}$          c) $\frac{Volt-Second}{ampere}$          d) $\frac{volt}{ampere}$

3. The square of the peak value of alternating current is equal to
   a) the square of rms current          b) two times the rms current          c) square root of the rms current          d) two times the square of rms current

4. When the instantaneous current and the emf are represented by $I = I \sin (\omega t - \frac{\pi}{2})$ and $e = E \sin (\omega t + \frac{\pi}{2})$, the current lags the voltage by
   a) 0          b) $-\frac{\pi}{4}$          c) $\frac{\pi}{2}$          d) $\pi$

5. A transformer steps up 220 V to 2200 V. If the secondary of the transformer has 200 turns, the number of turns in the primary coil is
   a) 10          b) 20          c) 22          d) 220

6. In a television set, the LCR antenna circuit has
   a) a variable capacitor          b) a variable resistor          c) a variable inductor          d) both variable R and C

7. In a series LCR circuit, if the value of inductance is doubled and capacitance is halved the resonant frequency would
   a) remain the same          b) be doubled          c) becomes four—fold          d) be halved

8. The frequency at which a 3.5 H inductor has an inductive reactance of 880 $\Omega$ is
   a) 40 Hz          b) 50 Hz          c) 500 Hz          d) 100 Hz

9. A capacitor, a inductor and a 30 $\Omega$ resistor are connect in series with 220 V ac. If the reactance of the circuit is 40$\Omega$. The rms value of current in the circuit is
   a) 4.4 A          b) 50 A          c) 3.33A          d) 5.5A

10. If a bulb is marked with a voltage rating of 240 V, the peak voltage of the ac through it can be approximately.
    a) 169.7V          b) 310 V          c) 339.4V          d) 415.7V

11. 420 KW of electric power is supplied to a small town at a distance 8 km away from the power plant. The transmission wire has a resistance of 0.33 Ohm. What is the power loss, if the power is transmitted at 21,000V?
    a) 0.132 KW          b) 0.825 KW          c) 1.32W          d) 1.32 KW
12. A current of 1 ampere flowing through a coil of inductance 1 Henry is switched off in one millisecond. What is the induced emf?
   a) +100V  
   b) -100V  
   c) +1000V  
   d) – 1000V

13. In a step up transformer, the input voltage is 220 V and the output voltage is 11 KV. The ratio of number of turns of secondary to primary is
   a) 50:1  
   b) 1:50  
   c) 25:1  
   d) 1:25

14. When the coil in an AC generator rotates at an angular velocity of 50 π rad/ sec. The frequency of the induced emf is
   a) 25 KHz  
   b) 50 Hz  
   c) 75 Hz  
   d) 100 Hz.

15. In an LCR circuit in series with a 220 V, 50 Hz AC, if L = 0.2 Henry, R = 35 ohms, C = \( \frac{1}{2 \times 10^3 \times \pi} \) farad and then in the circuit,
   a) current leads voltage by 30°  
   b) current leads voltage by 90°  
   c) current and voltage are in phase  
   d) voltage leads current by 60°

16. An aeroplane having a wing span of 20.48m flies north with velocity of 40 ms. Where the vertical component of earth’s magnetic field is 2 x 10^-5 T. The potential difference developed between the wings is
   a) 1.638 x 10^-2 V  
   b) 1.639 x 10^-2 V  
   c) 1.738 x 10^-2 V  
   d) 1.838 x 10^-2 V

17. An aeroplane having a wingspan of 50 m flies North over a locality where the vertical component of Earth’s magnetic field 4 x 10^-4 Tesla. If the potential difference developed between the wings is 2 volt, calculate the velocity of the aeroplane.
   a) 540 Km/hr  
   b) 360 Km/hr  
   c) 720 Km/hr  
   d) 180 Km/hr

18. The direction of the current induced in the armature of AC dynamo, reverses once in
   a) each quarter revolution  
   b) each half revolution  
   c) one full revolution  
   d) four revolutions

19. In an AC dynamo, if the magnetic field is halved and the angular velocity is doubled, the maximum emf induced in the coil
   a) is doubled  
   b) remains unaltered  
   c) is halved  
   d) becomes four fold

20. Calculate the self inductance of the coil when the current changes form 2 A to 6A in 0.5 secs and induces an emf of 12V.
   a) 1.5H  
   b) 6 H  
   c) 0.3H  
   d) 30 H
1. If \( C \) is the velocity of light in vacuum, then the velocity of light in a medium of refractive index \( \mu \) is
   a) \( \mu C \)  
   b) \( \frac{C}{\mu} \)  
   c) \( \frac{\mu}{C} \)  
   d) \( \frac{1}{\mu C} \)

2. Whenever light is reflected from the surface of the medium denser than the one in which it is traveling, it undergoes a phase change of
   a) \( \frac{\pi}{2} \)  
   b) \( \pi \)  
   c) \( 2\pi \)  
   d) \( \frac{3\pi}{4} \)

3. Light behaves as
   a) particles in high energy region and waves in low energy region.
   b) waves in high energy region and particles in low energy region.
   c) waves in high and low energy regions.
   d) particles in high and low energy regions.

4. Newton’s rings are obtained with a light of wavelength 6000\(^\circ\)A. The thickness of the film where the 10\(^{th}\) dark ring is formed is
   a) \( 3 \times 10^{-4} \) m  
   b) \( 3 \times 10^{-6} \) m  
   c) \( 2 \times 10^{-4} \) m  
   d) \( 2.5 \times 10^{-6} \) m

5. What type of wave front does a point source inside a double refracting crystal produce for the extraordinary ray?
   a) plane wavefront
   b) elliptical wavefront
   c) parabolic wavefront
   d) spherical wavefront

6. The velocity of light in a medium of refractive index 1.5 is
   a) \( 2 \times 10^8 \) m/s  
   b) \( 3 \times 10^8 \) m/s  
   c) \( 1.5 \times 10^8 \) m/s  
   d) \( 4 \times 10^8 \) m/s

7. The energy of a photon of red light of wavelength 6000 A\(^\circ\) is
   a) \( 3.32 \times 10^{-19} \) J  
   b) \( 3.32 \times 10^{-20} \) J  
   c) .332 \( 10^{-19} \) J  
   d) \( 3 \times 10^{-19} \) J

8. In Young’s double slit experiment, the separation between the slits is halved and the distance between the slit and screen is doubled then the fringe width will be
   a) halved  
   b) doubled  
   c) increased  
   d) increased by four times

9. In Young’s double slit experiment, one of the slits is covered with blue filter and the other with yellow filter. Then the interference fringes will
   a) be alternately blue and yellow  
   b) not occur
c) be alternately bright and dark       d) be broader
10. The scattering of light by colloidal particles is called
   a) Doppler effect  b) Tyndal effect  c) Raman effect  d) Rayleigh effect
11. If the velocity of light is diamond is $\frac{2}{5}$ of its velocity in air, the refractive index of diamond is
   a) 2  b) 2.5  c) .5  d) 5
12. In Newton’s ring experiment, the order of the dark ring having double the diameter of the 5th dark ring is
   a) 10  b) 20  c) 25  d) 35
13. A light of frequency $6 \times 10^{14}$ Hz is used in Young’s experiment. The separation of the slit is 0.1 mm and the fringe width is 9 mm. Then the screen is at a distance of
   a) 1.8 m  b) 3.2 m  c) 6.2 m  d) 5 m
14. In double slit experiment, the distance of the second dark fringe from the central maximum is 3 mm. Then, the distance of the fourth bright fringe from the central maximum is
   a) 2 mm  b) 4 mm  c) 8 mm  d) 12 mm
15. A plane diffraction grating has 4000 lines/cm. Then the width of the grating element is
   a) $0.25 \times 10^{-4}$ m  b) $2.5 \times 10^{-5}$ m  c) $3 \times 10^{-5}$ m  d) $4.2 \times 10^{-5}$ m
16. When a light of wavelength 6000 Å is incident normally on a thin film. Six dark rings are formed between two points. Calculate the thickness of the air film.
   a) $18 \times 10^{-7}$ m  b) $36 \times 10^{-7}$ m  c) $1.8 \times 10^{-7}$ m  d) $3.6 \times 10^{-7}$ m
17. If the wavelengths of two beams of light are 200 nm and 300 nm respectively, then the ratio of the amount of scattering is
   a) $\left(\frac{2}{3}\right)^{\frac{1}{4}}$  b) $\left(\frac{3}{2}\right)^{\frac{1}{4}}$  c) $\left(\frac{2}{3}\right)^{4}$  d) $\left(\frac{3}{2}\right)^{4}$
18. In Young’s double slit experiment, the distance of the screen from the source is 2 m and the fringe width is 5 mm. Keeping $\lambda$ and $d$ constant when the distance is increased to 3 m, the fringe width becomes
   a) 2.5 mm  b) 5 mm  c) 6 mm  d) 7.5 mm
19. Light enters into a rarer medium from a denser medium at an angle of incidence of 45°, when the refracted ray grazes the surface of separation of two media. Then the refractive index of the denser medium is
   a) $\sqrt{3}\over 2$  b) $\frac{1}{\sqrt{3}}$  c) $\sqrt{2}$  d) 2
20. In Young’s double slit experiment, when a light of wavelength 6000 Å is used, the Bandwidth is 2 mm. When the experiment is performed a medium of refractive index 1.33, then the band width is
a) 2.5 mm    b) 1mm    c) 2 mm    d) 1.5 mm
1. Wave number is
   a) number of waves produced in one second
   b) number of waves in one metre distance
   c) number of waves in \(3 \times 10^8\) m distance
   d) number of waves in a distance / m

2. In Millikan’s experiment, two plates separated by 4 cm in air are at a potential of 5V. Then the electric field is
   a) \(1 \text{Vm}^{-1}\)
   b) \(10 \text{Vm}^{-1}\)
   c) \(125 \text{Vm}^{-1}\)
   d) \(2 \text{Vm}^{-1}\)

3. If the radius of first orbit in \(\text{H}_2\) atom is 0.53 A\(^\circ\). Then the radius of second orbit is
   a) 1.06 A\(^\circ\)
   b) .265 A\(^\circ\)
   c) 2.12 A\(^\circ\)
   d) 4.24 A\(^\circ\)

4. The orbit of hydrogen atom in which an electron has maximum angular speed is
   a) \(n = 1\)
   b) \(n = 2\)
   c) \(n = 4\)
   d) \(n = 6\)

5. The potential energy of the electron in the ground state of hydrogen atom is
   a) -13.6 eV
   b) -27.2 eV
   c) 13.6 eV
   d) 27.2 eV

6. The kinetic energy of the electron in the ground state of hydrogen atom is
   a) -13.6 eV
   b) 13.6 eV
   c) 10 eV
   d) 1 eV

7. The electron in the ground state of hydrogen atom when provided an energy of 10.2 eV.
   It will jump to
   a) \(n = 1\)
   b) \(n = 3\)
   c) \(n = 2\)
   d) \(n = 4\)

8. The ratio of specific charge of an \(\alpha\) - particle to proton is
   a) 1:2
   b) 2:1
   c) 1:4
   d) 4:1

9. The transition that has maximum wavelength radiation is
   a) \(2 \rightarrow 1\)
   b) \(3 \rightarrow 2\)
   c) \(4 \rightarrow 3\)
   d) \(5 \rightarrow 4\)

10. The order of electron (e), proton (p), neutron (n) and alpha (a) when arranged according to the increasing magnitude of charge per unit mass
    a) e, p, n, a
    b) n, p, e, a
    c) n, p, a, e
    d) n, a, p, e

11. When an electron jumps from an orbit of higher energy \(E_1\) to an orbit of lower energy \(E_2\) the frequency of radiation occurring is given by
    a) \(\frac{E_1 - E_2}{h}\)
    b) \(\frac{E_2 - E_1}{h}\)
    c) \(\frac{E_1 + E_2}{h}\)
    d) \(\frac{E_1 + E_2}{h^2}\)
12. The ratio of the specific charge of an electron to positron is
   a) 1:1  b) 1 : 2  c) 2 :1  d) 1 : 4
13. For the diffraction of X – rays Bragg used a crystal of
   a) barium salt  b) magnesium salt  c) rock salt  d) quarz
14. If \( v_1 \), \( v_2 \) and \( v_3 \) are the velocities of cathode rays, canal rays and X-rays respectively, then
   a) \( v_1 = v_2 = v_3 \)  b) \( v_1 > v_2 > v_3 \)  c) \( v_2 > v_3 > v_1 \)  d) \( v_3 > v_1 > v_2 \)
15. The ratio of energies of the hydrogen atom in its second to third excited states is
   a) \( \frac{9}{4} \)  b) \( \frac{4}{9} \)  c) \( \frac{3}{2} \)  d) \( \frac{2}{3} \)
16. The mass of a charged oil drop is 1mg. If the oil drop is stationary in an electric field of 500 V cm\(^{-1}\), then the charge on the oil drop is
   a) \( 1.96 \times 10^{-10} \) C  b) \( 1.96 \times 10^{-19} \) C  c) \( 1.96 \times 10^{-17} \) C  d) \( 2.3 \times 10^{-12} \) C
17. A particle enters into a transverse magnetic field of 0.01T with a velocity of \( 10^7 \) ms\(^{-1}\) and moves in a circular path of radius 6mm. Then the specific charge of the particle is
   a) \( 1.67 \times 10^{11} \) C kg\(^{-1}\)  b) \( 1.67 \times 10^{12} \) C kg\(^{-1}\)  c) \( 1.67 \times 10^{11} \) C kg\(^{-1}\)  d) \( 16.7 \times 10^{19} \) C kg\(^{-1}\)
18. In Millikan’s experiment, if the total charge of a few oil drops was found to be \( 3.204 \times 10^{-18} \) C, then the number of charges should be
   a) 5  b) 10  c) 15  d) 20
19. In a Bragg’s spectrometer experiment, the glancing angle for the fourth order spectrum of the X-ray was found to be \( 30^\circ \). What will be the glancing angle for occurrence of the first order maximum?
   a) \( \sin^{-1} 0.25 \)  b) \( \sin^{-1} 0.125 \)  c) \( \sin^{-1} 0.5 \)  d) \( \sin^{-1} 0.123 \)
20. If \( \lambda_n \) is the wavelength of the \( n^{th} \) line of paschen spectral series of hydrogen, then \( \frac{\lambda_3}{\lambda_2} = \)
   a) \( \frac{20}{27} \)  b) \( \frac{25}{28} \)  c) \( \frac{64}{75} \)  d) \( \frac{75}{64} \)
21. In holography which one of the following is recorded?
   a) frequency and amplitude  b) phase and frequency
   c) phase and amplitude  d) frequency only
22. In hydrogen atom which of the following transitions produce spectral line of maximum frequency
   a) \( 2 \rightarrow 1 \)  b) \( 6 \rightarrow 2 \)  c) \( 4 \rightarrow 3 \)  d) \( 5 \rightarrow 1 \)
23. If the Rydberg constant is \( 1.097 \times 10^7 \) m\(^{-1}\), calculate the shortest wavelength of the lyman spectral series of hydrogen atom.
   a) \( 911.5 \)Å  b) \( 912.5 \)Å  c) \( 910.5 \)Å  d) \( 913.5 \)Å
24. The glancing angle for a first order diffraction for a light of wavelength \( 0.58 \)Å is \( 6^\circ.27^\prime \) calculate the distance between the lattice planes.
a) $2A^\circ$

b) $2.58A^\circ$

c) $1A^\circ$

d) $1.5A^\circ$
1. In the stopping potential $V_s$ frequency plot, the Y-intercept is found to be -3V. Then the maximum wavelength allowed for the photoelectric emission to take place is  
   a) 4140A°  
   b) 4500A°  
   c) 5125A°  
   d) 5600A°

2. The photoelectric current is 1 $\mu$A in a system, when the frequency of the incident light is 1.5 times the threshold value. If the frequency is halved and the intensity is increased four times, the current becomes  
   a) 20 $\mu$A  
   b) $\mu$A  
   c) Zero  
   d) 5 $\mu$A

3. If the velocity of the fastest photoelectron is $1.876 \times 10^6$ m$s^{-1}$, then the potential required to bring it to rest is  
   a) 1 V  
   b) 10V  
   c) 150V  
   d) 200V

4. If the photoelectric work function for a material is $3 \times 10^5$eV, then the electromagnetic radiation which can cause photoelectric emission on it is  
   a) X-rays  
   b) gamma rays  
   c) IR rays  
   d) UV rays

5. The de-broglie wavelength of a proton moving with the velocity of $\frac{C}{2}$ is  
   a) $2 \times 10^{-14}$m  
   b) $20 \times 10^{-4}$m  
   c) $3 \times 10^{-16}$m  
   d) $30 \times 10^{-16}$m

6. The orbit of H$_2$ atom in which 4.24$\pi$ A° is the de-Broglie wavelength of an electron is  
   a) 1  
   b) 3  
   c) 4  
   d) 6

7. If an electron and a proton have the same kinetic energy, then the ratio of the de-Broglie wavelength of proton to that of electron is  
   a) 1:1836  
   b) $1: \sqrt{1836}$  
   c) $1836:1$  
   d) $\sqrt{1836} : 1$

8. The ratio of de-Broglie wavelength of an electron and proton possessing the same momentum is  
   a) 1 : 1  
   b) 1 : 1836  
   c) $1836 : 1$  
   d) 4 : 1

9. The de-Broglie wavelength of an electron moving with a kinetic energy of 20eV is  
   a) $1.25$A°  
   b) $2.5$A°  
   c) $2.75$A°  
   d) $3$A°

10. If the ratio of de-Broglie wavelength of two particles moving at the same speed is 1 : 4, then the particles are respectively  
    a) proton, $\alpha$- particle  
    b) $\alpha$- particle, proton  
    c) electron, proton  
    d) proton, electron

11. The de-Broglie wavelength of a particle of momentum $2.2 \times 10^{-24}$ Kgms$^{-1}$ is  
    a) $1$A°  
    b) $3$A°  
    c) $5$A°  
    d) $7$A°

12. When two photons on energy 2.5eV are incident simultaneously on a metal whose work function is 4.5eV then  
    a) one electron will be emitted  
    b) two electrons will be emitted  
    c) more then two electrons will be emitted  
    d) electrons will not be emitted

13. The length of 1m rod moving with a speed of $15 \times 10^7$ ms$^{-1}$ relative to a stationary observer is  
    a) 2m  
    b) $\sqrt{2}$m  
    c) $\sqrt{3}$m  
    d) $\frac{\sqrt{3}}{2}$m

14. The time interval between two events as measured by an observer moving at speed of $\frac{\sqrt{3}}{2}$C is 2s. Then the time interval between the same events as measured by a stationary observer is  
    a) 2s  
    b) 4s  
    c) 6s  
    d) 8s

15. If the mass of a moving particle is 2 times its rest mass then its speed is  
    $\sqrt{3}$  
    C  
    2  
    C  
    4  
    C  
    8

LESSON 8

NUCLEAR PHYSICS

1. Equivalence of $4.98 \times 10^{-27}$ kg is
   a) 1amu  
   b) 2amu  
   c) 3amu  
   d) 10.5amu

2. The mass effect of Helium nucleus is 0.0304amu. The binding energy of helium nucleus will be
   a) 2.83MeV  
   b) 28.3MeV  
   c) 7.68MeV  
   d) 7.47MeV

3. The binding energy of $^{16}_8O$ is 127.63MeV. The average binding energy per nucleon is
   a) 7.977MeV  
   b) 15.95MeV  
   c) 79.77MeV  
   d) 7.977eV

4. How much energy is released in the following reaction
   $A(1.002amu) + B(1.005amu) \rightarrow C(1.001amu) + D(1.003amu) + Q$
   a) 2.793MeV  
   b) 0.931MeV  
   c) 0.310MeV  
   d) 1.862MeV

5. Radio active actinium ($A = 227, Z = 89$) undergoes a series of disintegration and finally yields $^{207}_{82}Pb$
   the minimum number of $\alpha$ and $\beta$ particles involved in this disintegration is
   a) 3$\alpha$, 5$\beta$  
   b) 5$\alpha$, 3$\beta$  
   c) 4$\alpha$, 5$\beta$  
   d) 5$\alpha$, 2$\beta$

6. How many pairs of ions are produced in one gram of air for one milliroentgen radiation
   a) $1.6 \times 10^{10}$ pairs  
   b) $1.16 \times 10^{10}$ pairs  
   c) $1.6 \times 10^9$ pairs  
   d) $1.6 \times 10^{12}$ pairs

7. A free neutron decays as follows $^{0}_1n \rightarrow ^1_1H + ^0_1e + \gamma$ here $\gamma$ is
   a) photon  
   b) neutron  
   c) meson  
   d) antineutrino

8. The half life of a radioactive element is independent of
   a) the temperature  
   b) the pressure  
   c) the amount of element present  
   d) all the above

9. If the number of disintegrations per minute in 1 gm of $^{14}_6C$ initially 15.3 the number of disintegrations
   after 11140 years is
   a) 15.3  
   b) 7.65  
   c) 3.83  
   d) 30.6

10. The half life of a radioactive element is 56 secs, how long does it take for $\left(\frac{7}{8}\right)$ of it to be lost in decay?
    a) 156 seconds  
    b) 158 seconds  
    c) 166 seconds  
    d) 168 seconds

11. Find how long it will take for 87.5% of a sample of $^{198}_7Au$ to decay if its half life is 2.7 days
    a) 8.1 days  
    b) 4.725 days  
    c) 10.8 days  
    d) 12.8 days

12. If the half life of neutron is 13 minutes what is its mean life?
    a) 16 S  
    b) 12 S  
    c) 560 S  
    d) 1125 S

13. The mean life of a radioactive material that reduces to $\left(\frac{1}{16}\right)$ of its initial value in 28 days is
    a) 5 days  
    b) 10 days  
    c) 12 days  
    d) 16 days

14. Half life of a radioactive element is 25 hours. After 100 hours what will be the fraction of the sample left undecayed?

a) $\frac{1}{4}$  

b) $\frac{1}{2}$  

c) $\frac{1}{8}$  

d) $\frac{1}{16}$
15. The positive ions from the velocity selector move in circular path of radii 16cm and 25cm in a transverse magnetic field. Then the ratio between the masses of the ions is
   a) 4 : 5  b) 5 : 4  c) 25 : 16  d) 16 : 25

16. A breeder reactor converts
   a) U^{235} into plutonium 239  b) U^{238} into plutonium 239
   c) U^{238} into U^{235}  d) U^{235} into U^{238}

17. Stellar energy is due to
   a) Nuclear fusion  b) nuclear fission  c) chemical combination  d) explosion

18. Nuclear reaction that takes place in stars is
   a) Carbon – carbon cycle  b) Carbon – nitrogen cycle
   c) Proton – proton cycle  d) Proton – neutron cycle

19. The reactor that converts fertile material into fissile material is called
   a) breeder reactor  b) power reactor  c) research reactor  d) nuclear reactor

20. In nuclear fusion, energy is released due to the fusion of
   a) Lighter nuclei  b) heavy nuclei  c) A light and a heavy nuclei  d) all the above

21. If the radius of a nucleus with mass number 20 is 2fm, then the radius of the nucleus with mass number 160 is
   a) 4 fm  b) 2 fm  c) 6 fm  d) 3 fm

22. The ratio of the nuclear radii of mass numbers 10 and 80 is
   a) 1 : 2  b) 1 : 4  c) 1 : 3  d) 1 : 8

23. An atom has 108 protons and 108 neutrons. The diameter of the nucleus is
   a) 12.4 F  b) 7.8 F  c) 3.9 F  d) 15.6 F

24. The only reactor that uses \textit{\textsuperscript{233}}U as fuel is
   a) Apsara  b) Kamini  c) Zerlina  d) Purnima

25. In a nuclear reactor Plutonium or Polonium or Radium with Beryllium is used as
   a) neutron source  b) Moderator  c) Control rods  d) Coolant

26. The percentage of \textit{\textsuperscript{\alpha}} particles in primary cosmic rays is
   a) 6%  b) 9%  c) 10%  d) 25%

27. The fission reaction that takes place in sun is
   a) Proton – Proton cycle  c) Carbon – Nitrogen cycle
   b) Carbon – Proton cycle  d) Proton – Neutron cycle
1. The region below the curve corresponding to \( I_B = 0 \) on the output characteristic curve of CE mode is known as:
   a) saturation region  b) cut-off region  c) leakage region  d) forbidden region

2. The important condition for an oscillator are:
   a) \( A\beta = 0 \), negative feedback  b) \( A\beta = 0 \), positive feedback
   c) \( A\beta = 1 \), negative feedback  d) \( A\beta = 1 \), positive feedback

3. The amplitude of oscillations produced by a tank circuit decreases due to:
   a) the inductive reactance  b) the capacitive reactance
   c) both the inductive reactance and capacitive reactance  d) the release of energy

4. The capacitance \( C_E \) connected across the emitter resistor \( R_E \) of a two stage \( R_C \) couple amplifier has:
   a) a low capacitance value  b) a high capacitance value
   c) a high capacitive reactance  d) none of these

5. In a tank circuit the energy in the inductance coil is stored as:
   a) electrical energy  b) magnetic energy  c) heat energy  d) electromagnetic energy

6. If \( \alpha \) and \( \beta \) are the current gains in the CB and CE configuration, then \( \frac{1}{\beta} - \frac{1}{\alpha} \) is:
   a) 0  b) 1  c) \( \alpha \)  d) 2

7. In a CE configuration, the base current is 200 \( \mu \)A and the collector current is 2mA. Then the current gain is:
   a) 10  b) 20  c) 15  d) 25

8. If \( \beta \) and \( I_E \) of a transistor are 100 and 0.95mA respectively then the value of \( I_C \) is:
   a) .93mA  b) .94mA  c) .96mA  d) .86mA

9. In a common base configuration, the current gain is 0.95. If the emitter current is 1mA then the base current is:
   a) .1mA  b) .5mA  c) .05mA  d) 5mA

10. The base emitter voltage of 300mV is applied to a transistor in CE mode. If the base current is 200\( \mu \)A. Then the input impedance is:
    a) 1.5 K\( \Omega \)  b) 1.5\( \Omega \)  c) 6K\( \Omega \)  d) 6\( \Omega \)

11. The resonant frequency of an oscillator whose inductance and capacitance values are \( \frac{10^2}{\pi^2} \) H and 25\( \mu \)F respectively is:
    a) 3140 Hz  b) 314 Hz  c) 10^4Hz  d) 10^3Hz

12. The voltage gain of an amplifier is 10 and its current gain is 5, its power gain is:
    a) 5  b) 250  c) 50  d) 500

13. The voltage gain of an amplifier without feedback is 100. If a negative feedback with \( \beta = 0.1 \) is introduced, then the gain of the amplifier is:
    a) 10  b) 100  c) 9.09  d) 90.0

14. The output of the above logic gate combination is:

---

a) \((A+B) \cdot (\bar{C} + \bar{D})\)  

b) \(AB + CD\)

c) \((\bar{A} + \bar{B}) \cdot (C + D)\)  

d) \(\bar{A}B + \bar{C}D\)
15. The gain of the amplifier reduces from 50 to 25 when a negative feedback is given then the feedback fraction is
   a) \( \frac{1}{5} \)  
   b) \( \frac{1}{10} \)  
   c) \( \frac{1}{20} \)  
   d) \( \frac{1}{50} \)

16. What are the truth values of the Boolean function F, realized by the above circuit for
   (a) A = 0, B = 1, C = 0, D = 1 (b) A = 1, B = 1, C = 0, D = 0
   a) (a) 0, (b) 0  
   b) (a) 0, (b) 1  
   c) (a) 1, (b) 0  
   d) (a) 1, (b) 1

17. When three amplifiers are cascaded the overall gain of the amplifier is 750. If the individual gains of the amplifier are in the ratio 1:2:3 respectively, then the gain of individual amplifiers are
   a) 5, 10, 15  
   b) 10, 20, 30  
   c) 5, 15, 25  
   d) 10, 15, 25

18. A no inverting Op-amp gives an output of 3V for an input of 1V. If \( R_{in} \) is 2s\( \Omega \) then the value of feedback resistor is
   a) 2 K\( \Omega \)  
   b) 3\( \Omega \)  
   c) 5 K\( \Omega \)  
   d) 4 K\( \Omega \)

19. An inverting Op-amp is designed to get an output of -5V for the input of 50 mV the \( R_{in} \) and \( R_{m} \) resistors used are respectively.
   a) 1k\( \Omega \), 10 k\( \Omega \)  
   b) 1K\( \Omega \), 100\( \Omega \)  
   c) 10K\( \Omega \), 1 k\( \Omega \)  
   d) 100\( \Omega \), 10 \( \Omega \)

20. A galvanometer is converted into an ammeter with a range of 0.1 A by shunting a resistance of 0.1\( \Omega \). For the range of 0.10 A shunting resistance used is
   a) 1\( \Omega \)  
   b) 0.1\( \Omega \)  
   c) 0.01\( \Omega \)  
   d) 10\( \Omega \)

21. A galvanometer is converted into an ohm-meter by connecting a battery of 1 V and resistance of 1000\( \Omega \) in series. If the galvanometer reads 0.5mA for an unknown resistance, then its value is
   a) 1 k\( \Omega \)  
   b) 2 K\( \Omega \)  
   c) K\( \Omega \)  
   d) 5 K\( \Omega \)

22.
   a) -1 V  
   b) -2 V  
   c) -4 V  
   d) -0.5V

23. In a single stage CE amplifier, the mid-frequency gain is 10, the gain at upper cut off frequency is
   a) 10  
   b) 14.14  
   c) 7.07  
   d) 20

24. The Boolean expression for NAND gate is
   a) \( Y = A + B \)  
   b) \( Y = A \cdot B \)  
   c) \( Y = \overline{A} \)  
   d) \( Y = \overline{AB} \)

25. The output of NOT gate is
   a) always 1  
   b) always 0  
   c) complement of input  
   d) all the above

26. In an inverting amplifier the input and output are out of phase by
   a) \( \pi \)  
   b) \(-\pi\)  
   c) \(\frac{3\pi}{2}\)  
   d) \(\frac{\pi}{4}\)

27. In a single stage CE amplifier, the emitter bypass Capacitor \( C_E \) has
a) low capacitive reactance  
b) high capacitive reactance  
c) low capacitance  
d) all the above

**LESSON 10**

**COMMUNICATION SYSTEMS**

1. If the amplitude of the LSB in an Am wave is 0.5 V and the modulation factor is 0.6 then the signal amplitude is
   a) 0.5V  
   b) 1 V  
   c) 1.5 V  
   d) 2V

2. The frequency of the LSB and USB components in an AM wave are 995 KHz and 1005 KHz respectively then the frequency of the carrier is
   a) 1 KHz  
   b) 1 MHz  
   c) 10 KHz  
   d) 100 KHz

3. The frequency of LSB ranges from 995 KHz and the carrier frequency is 1 MHz. Then, the channel width is
   a) 5 KHz  
   b) 10 KHz  
   c) 3 KHz  
   d) 20 KHz

4. A FM signal has the highest and the lowest frequencies of 100.06 MHz and 100.04 MHz when modulated by a signal. The carrier swing is
   a) 10 KHz  
   b) 20 KHz  
   c) 5 KHz  
   d) 15 KHz

5. A FM signal has highest and lowest frequencies of 100.5 MHz and 99.5 MHz then the resting frequency is
   a) 1 MHz  
   b) 10 MHz  
   c) 100 MHz  
   d) 1000 MHz

6. The FM signal produced from PM signal is
   a) very stable  
   b) less stable  
   c) unstable  
   d) noisy

7. In satellite communication the downlink frequencies are kept different from the uplink frequencies in order to avoid
   a) interference  
   b) distortion  
   c) modulation  
   d) demodulation

8. A local oscillator with a frequency of 1.245 MHz in a superhetrodyne AM receiver can be used to tune a station of frequency
   a) 455 KHz  
   b) 790 KHz  
   c) 690 KHz  
   d) 990 KHz

9. To tune a station of frequency 95.3 MHz the local oscillator in a FM receiver has to produce a frequency of
   a) 106 MHz  
   b) 108 MHz  
   c) 110 MHz  
   d) 112 MHz

10. Blanking pulse is a
    a) high negative potential  
    b) low negative potential  
    c) high positive potential  
    d) low positive potential

11. The time taken to scan one line in simple scanning is
    a) 16 µs  
    b) 32 µs  
    c) 64 µs  
    d) 86 µs

12. The time taken to scan one frame in the process of simple scanning is
    a) .04 s  
    b) .4 s  
    c) 4 s  
    d) 40 s

13. If the range of a target is 600m, the time taken by the radar pulse to reach the target and travel back to the radar is

a) 2 µs  

b) 4 µs  
c) 6 µs  
d) 8 µs
14. As per WARC for commercial communication satellites the allowed uplink wavelength is
   a) 10 cm    b) 5 cm    c) 15 cm    d) 20 cm

15. The allowed downlink wavelength for commercial communication as per WARC is
   a) 7.5 cm    b) .75 cm    c) .075 cm    d) 75 cm

16. In actual practice, the satellite downlink wavelength range is
   a) 8.82 cm to 6.25 cm    b) 6 cm to 7.25 cm
   c) 8.6 cm to 5.3 cm    d) 8 cm to 3.2 cm

17. The satellite uplink wavelength range in actual practice is
   a) 3.2 cm to 4.2 cm    b) 5.24 cm to 4.24 cm
   c) 6.2 cm to 7.2 cm    d) 4.32 cm to 6.82 cm

18. The radio waves gets refracted from difference parts of the ionosphere and reach earth are called
   a) surface waves    b) sky waves    c) space waves    d) microwaves

19. What is called aquadag in monochrome picture tube?
   a) Filament    b) High voltage
   c) Internal metallic coating    d) Magnetic coil

20. Magnetic coils surrounding the neck of the picture tube is called
   a) deflecting yoke    b) aquadag    c) attracting yoke    d) none of the above

21. The face or front of the picture tube is coated internally with a
   a) flourescent material    b) phosphorescence material
   c) non-conducting material    d) conducting material

22. The waves used by Radar to detect and fix the position of the target is
   a) Radio waves    b) Microwaves    c) IR rays    d) UV rays