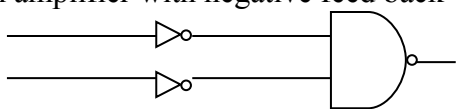


PART A

30 x 1 = 30

- A hollow spherical shell carrying an electric charge produces no electric field at points
(a) outside the sphere (b) on its surface (c) inside the sphere (d) at infinite distance from the centre
- The work done in moving a charge of $500 \mu\text{C}$ between two points on equi potential surface is
(a) zero (b) finite positive (c) finite negative (d) infinite
- An electric dipole with dipole moment $4 \times 10^{-9} \text{ Cm}$ is kept at 30° with the direction of uniform electric field of magnitude $5 \times 10^4 \text{ NC}^{-1}$. The magnitude of torque on the dipole is
(a) 10^{-4} Nm (b) 10^4 Nm (c) $2 \times 10^{-5} \text{ Nm}$ (d) 10^{-5} Nm
- When two point charges $+6\text{C}$ and -5C experiences a force of $2.7 \times 10^{11} \text{ N}$, the distance between them is
(a) 0.5 m (b) 1 m (c) 10 m (d) 10 cm
- The current flowing in a conductor is proportional to
(a) drift velocity (b) $\frac{1}{\text{area of cross section}}$
(c) $\frac{1}{\text{number of electrons}}$ (d) square of the area of cross section
- Of the following devices, which has small resistance?
(a) moving coil galvanometer (b) voltmeter
(c) ammeter of range 0 – 2A (d) ammeter of range 0 – 10 A
- A proton enters into a uniform magnetic field of induction 2.5 T with a velocity of $2.5 \times 10^6 \text{ ms}^{-1}$ by making an angle of 30° with the direction of the field. The Lorentz force on the proton is
(a) $5 \times 10^{-10} \text{ N}$ (b) $5 \times 10^{-11} \text{ N}$ (c) $5 \times 10^{-12} \text{ N}$ (d) $5 \times 10^{-13} \text{ N}$
- Lenz's law is in accordance with the law of conservation of _____
(a) charge (b) flux (c) momentum (d) energy
- Transformer works on
(a) AC only (b) DC only (c) both AC and DC (d) neither AC nor DC
- In an AC circuit, the
(a) average value of current is zero (b) average value of square of the current is zero
(c) average power dissipation is zero (d) rms current is $\sqrt{2}$ times the peak value
- An emf of 60 mV is induced in a coil when the current in the neighbouring coil changes from 11 A to 5 A in 0.1 sec. The coefficient of mutual induction is
(a) 0.003 H (b) 0.1 H (c) 0.01 H (d) 0.001 H
- In an electromagnetic wave, the phase difference between electric field \vec{E} and the magnetic field \vec{B} is
(a) π (b) $\pi/2$ (c) $\pi/4$ (d) zero
- If the wavelength of the light is reduced to one fourth, the amount of scattering is
(a) increased by 16 times (b) decreased by 16 times
(c) increased by 256 times (d) decreased by 256 times
- Unit of grating element is
(a) metre (b) radian (c) radian/sec (d) no unit
- In Newton's ring experiment, the radius of the n^{th} dark is twice the radius of 3^{rd} dark ring. The value of 'n' is
(a) 2 (b) 6 (c) 12 (d) 3
- The elliptical orbits of electron in the atom were proposed by
(a) J. J. Thomson (b) Bohr (c) Sommerfeld (d) De Broglie
- If the electric field $E = 3 \times 10^4 \text{ V/m}$ and the magnetic field $B = 2 \times 10^{-3} \text{ T}$ are acting perpendicular to each other, then the velocity of electrons passing through them without deviation is
(a) 60 ms^{-1} (b) $1.5 \times 10^7 \text{ ms}^{-1}$ (c) $0.67 \times 10^{-7} \text{ ms}^{-1}$ (d) 50 ms^{-1}
- Maser materials are
(a) diamagnetic ions (b) paramagnetic ions (c) ferromagnetic ions (d) non-magnetic ions
- X – ray is
(a) Phenomenon of conversion of K.E. into radiation (b) Conversion of momentum
(c) Conversion of energy into mass (d) Principle of conservation of charge
- In electron microscope, the potential difference required is
(a) $6 \times 10^3 \text{ V}$ (b) $6 \times 10^4 \text{ V}$ (c) 10^5 V (d) $6 \times 10^2 \text{ V}$
- According to theory of relativity, the length of the rod in motion
(a) is the same as its rest length (b) is less than its rest length
(c) is greater than its rest length (d) becomes infinity
- Anaemia can be diagnosed by
(a) I^{131} (b) Na^{24} (c) P^{32} (d) Fe^{59}

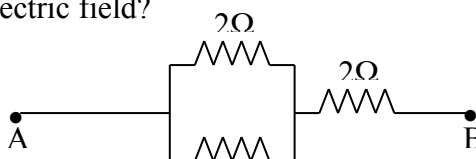
23. A nucleus contains 64 nucleons. The nuclear radius is
 (a) 2.6 F (b) 5.2 F (c) 10.4 F (d) 7.8 F
24. An elementary particle has a rest mass 500 times that of an electron. To which category does it belong?
 (a) photon (b) lepton (c) meson (d) hyperons
25. The colour of the light emitted by a LED depends on
 (a) its reverse bias (b) its forward bias
 (c) the amount of forward current (d) type of semiconductor material
26. An Oscillator is
 (a) simply an amplifier without feed back (b) an amplifier with positive feed back
 (c) an amplifier with negative feed back (d) a convertor of ac into dc
27. 
- The above logic gate circuit behaves like
 (a) AND gate (b) NAND gate (c) OR gate (d) NOR gate
28. In Amplitude modulation, the band width is _____ the signal frequency
 (a) equal (b) twice (c) thrice (d) four times
29. The principle used in Fibre optical communication is
 (a) refraction (b) total internal reflection (c) diffraction (d) polarisation
30. The blanking pulse is applied to the _____ of the electron gun.
 (a) deflecting coils (b) cathode (c) control grid (d) filament

PART – II

Answer any 15

(15 x 3 = 45)

31. State Gauss's law.
32. What happens if a polar molecule is placed in an electric field?
33. State second law of electrolysis.
34. Give any three applications of super conductors.
35. Find the effective resistance between A and B.
36. Define : Peltier coefficient.
37. A conductor of length 2 m is moving with a velocity of 36 km/hr in the uniform magnetic field of induction 10^{-5} tesla. Find the emf induced across the conductor.
38. Define Q factor. What does it refer?
39. The sun appears reddish during Sun rise and Sun set. Why?
40. A light of wavelength 6000 \AA falls normally on the thin air film. If 6 dark fringes are seen between two points, calculate the thickness of the air film.
41. What are the conditions to achieve Laser action?
42. A Coolidge tube operates at 24800 volt. Calculate the maximum frequency of X-rays emitted from the tube.
43. Mention the limitations of electron microscope.
44. What is radio-carbon dating?
45. What are primary and secondary cosmic rays?
46. Draw the frequency response curve of single stage R – C coupled amplifier.
47. A base – emitter voltage of 200 mV is applied to a transistor in C – E mode. If the base current is $100 \mu\text{A}$. find the input impedance.
48. What is zener break down?
49. What are the advantages of negative feedback?
50. What is known as skip distance?



PART – III

54 Q is compulsory. Of the remaining 11 Qs, answer any 6

(7 x 5 = 35)

51. An electric dipole of charge $+2 \mu\text{C}$ and $-2 \mu\text{C}$ are separated by a distance of 1 cm. Calculate the electric field due to dipole at a point of distance 1m. (i) from the centre of axial line and (ii) from the centre of equatorial line.
52. Explain the determination of the internal resistance of a cell using voltmeter.
53. Describe Daniel cell.
54. A straight wire of length 1 m and resistance 2 ohm is connected across a battery of emf 12 volts. The wire is placed normal to the magnetic field of induction $5 \times 10^{-3} \text{ T}$. Find the force on the wire.
- (OR)
- A moving coil galvanometer of resistance 20Ω produces full scale deflection for a current of 50 mA. How will you convert it into (i) an ammeter of range 20A and (ii) A voltmeter of range 120 V?
55. Derive the expression for the self inductance of a long solenoid.
56. On the basis of wave theory, explain reflection of a plane wave front at a plane surface.
57. Explain the spectral series of hydrogen atom. (diagram is not necessary)

58. State the laws of photoelectric emission.
59. Derive an expression for deBroglie wavelength of matter waves.
60. The isotope ${}_{92}\text{U}^{238}$ successively undergoes three α - decays and two β - decays. What is the resulting isotope?
61. Explain the half wave rectification.
62. With block diagram, explain the function of superhetrodyne AM receiver.

PART – IV

Answer any 4

(4 x 10 = 40)

63. Explain with principle, the construction and working of Vandegraff generator. What is its use?
64. State and verify Joule's law of heating effect.
65. With the help of vector diagram and impedance vector diagram obtain the expression for (i) effective voltage (ii) impedance (iii) the phase relation between current and voltage in LCR series circuit.
66. Derive the expression for the band width of interference band.
67. Describe Millikan's oil drop experiment to determine the charge of an electron.
68. What is a nuclear reactor? Explain the parts (i) moderator and (ii) control rods in a reactor. Mention the uses of nuclear reactor.
69. What is called amplifier? With a circuit explain the working of transistor as amplifier.
70. Analyse the amplitude modulated wave and discuss its frequency spectrum and bandwidth.