(English Version)

Instructions : 1. *All Parts are compulsory.*

2. *Answer without relevant diagram/figure/circuit wherever necessary will not carry any marks.*

3. *Numerical problems solved without writing the relevant formulae carry no marks.*

PART – A

I. Answer **all** the following questions : **(10 × 1 = 10)**

1) State Coulomb's law.

2) Define mobility of electron.

3) What is the significance of Lenz's law?

4) Define displacement current.

5) Write one application of microwave.

6) How the power of a lens is related to its focal length?

7) Write the expression for de-Broglie wavelength of a particle.

8) What is the conclusion of Davisson – Germer experiment on the nature of electron?

9) Write the SI unit of activity.

10) What is transducer in communication system?

PART – B

II. Answer **any five** of the following questions : **(5 × 2 = 10)**

11) Write any two properties of electric field lines.

12) On what factors does the capacitance of a parallel plate capacitors depends?

13) State and explain Ohm's law.

14) Define the terms :
   i) Declination
   ii) Inclination or Dip.

15) State and explain Faraday's law of electromagnetic induction.

16) Name the type of lens which is used to correct
   i) Myopia
   ii) Hypermetropia.

17) What is NAND gate? Give its logic symbol.

18) Draw the block diagram of a AM receiver.

PART – C

III. Answer **any five** of the following questions : **(5 × 3 = 15)**

19) Derive the relation between electric field and electric potential due a point charge.

20) Derive the expression for energy stored in a charged capacitor.

21) Explain with circuit diagram how to convert galvanometer into an voltmeter.

22) Derive the expression for motional emf induced in a conductor moving in a uniform magnetic field.

23) What is transformer? Mention two sources of energy loss in a transformer.

24) Mention any three applications of polaroids.

25) Write any three experimental observations of photoelectric effect.

26) Give any three differences between n-type and p-type semiconductors.

PART – D

IV. Answer **any two** of the following questions : **(2 × 5 = 10)**

27) Deduce the condition for balance of a Wheatstone's bridge using Kirchhoff's rules.

28) Derive the expression for magnetic field at a point on the axis of a circular current loop.

29) Write any five properties of ferromagnetic materials.

V. Answer **any two** of the following questions : **(2 × 5 = 10)**

30) Derive Lens Maker's formula for a convex lens.

31) State radioactive decay law. Derive $N = N_0 e^{-\lambda t}$ for a radioactive element.

32) What is rectification? With relevant circuit diagram and waveforms explain the working of p-n junction diode as a full wave rectifier.

VI. Answer **any three** of the following questions : **(3 × 5 = 15)**

33) Two point charges $q_A = 3\mu\ c$ and $q_B = -3\mu\ c$ are located 20 cm apart in vacuum.

a) What is the electric field at the mid point O of the line AB joining the two charges?

b) If a negative test charge of magnitude $1.5 \times 10^{-9} C$ is placed at this point. What is the force experienced by the test charge?

34) When two resistors are connected in series with a cell of emf 2 V and negligible internal resistance, a current of $\frac{2}{5}$ A flows in the circuit. When the resistors are connected in parallel the main current is $\frac{5}{3}$ A. Calculate the resistances.

35) A source of alternating emf of 220 V – 50 Hz is connected in series with a resistance of 200 Ω an inductance of 100 mH and a capacitance of 30 μF. Does the current lead or lag the voltage and by what angle?

36) Light of wave length 6000 A° is used to obtain interference fringes of width 6 mm in a Young's double slit experiment. Calculate the wave length of light required to obtain fringe of width 4 mm when the distance between the screen and slits is reduced to half of its initial value.

37) The first member of the Balmer series of hydrogen atom has wavelength of 6563 A°. Calculate the wavelength and frequency of the second member of the same series. Given : $C = 3 \times 10^8 ms^{-1}$.