

(English Version)

2018

- 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**

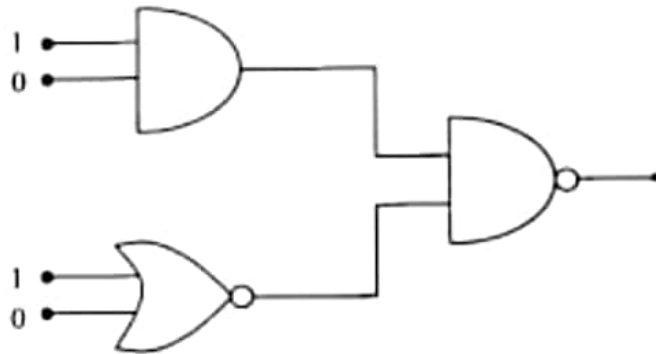
I. Answer all the following questions : (10 × 1 = 10)

- 1) What is an equipotential surface?
- 2) Define 'drift velocity' of free electrons.
- 3) Give an application of cyclotron.
- 4) State Faraday's law of electro magnetic induction.
- 5) If the peak value of a.c. current is 4.24 A, what is its root mean square value?
- 6) Mention one power loss in transformer.
- 7) Two lenses of power +1.5D and –0.5D are kept in contact on their principal axis. What is the effective power of the combination?
- 8) The decay of proton to neutron is possible only inside the nucleus. Why?

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9) What is 'depletion region' in a semi conductor diode?

10)



What is the output of this combination?

### PART - B

II. Answer any five of the following questions :

(5 × 2 = 10)

- 11) Mention any two factors on which the capacitance of a parallel plate capacitor depends.
- 12) State Kirchhoff's laws of electrical network.
- 13) Define magnetic 'declination' and 'dip' at a place.
- 14) Write the expression for magnetic potential energy of a magnetic dipole kept in a uniform magnetic field and explain the terms.
- 15) Give any two applications of X-rays.

- 16) What is 'myopia'? How to rectify it?
- 17) Draw the diagram representing the schematic arrangement of Geiger-Marsden experimental set up for the alpha particle scattering.
- 18) Write any two characteristics of nuclear forces.

**PART – C**

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

- 19) Give three properties of electric charge.
- 20) State Ampere's circuital law and arrive at the expression for the magnetic field near a straight infinite current carrying wire.
- 21) What is hysteresis? Define the terms 'coercivity' and 'retentivity' of a ferromagnetic material.
- 22) Arrive at Snell's law of refraction, using Huygen's principle for refraction of a plane wave.
- 23) Write Bohr's postulates for the hydrogen atom model.
- 24) Derive the expression for the half-life of a radio active nuclide.
- 25) Write any three distinctions between p-type and n-type semi conductor.
- 26) Draw the block diagram of generalised communication system.

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PART – D

IV Answer **any two** of the following questions :

(2 × 5 = 10)

- 27) Define electric potential due to a point charge and arrive at the expression for the electric potential at a point due to a point charge.
- 28) Obtain the expression for the effective emf and the effective internal resistance of two cells connected in parallel such that the currents are flowing in the same direction.
- 29) Derive the expression for the magnetic field on the axis of a circular current loop, using Biot-Savart's law.

V Answer **any two** of the following questions

(2 × 5 = 10)

- 30) Arrive at the expression for the impedance of a series LCR circuit using phasor diagram method and hence write the expression for the current through the circuit.
- 31) Deduce the relation between  $n$ ,  $u$ ,  $v$ ,  $O$ ,  $R$  for refraction at a spherical surface, where the symbols have their usual meaning.
- 32) What is a rectifier? With suitable circuit describe the action of a full wave rectifier by drawing input and output waveforms.

VI. Answer **any three** of the following questions :

(3 × 5 = 15)

- 33) Three charges each equal to  $+4nC$  are placed at the three corners of a square of side 2cm. Find the electric field at the fourth corner.
- 34) 100 mg mass of nichrome metal is drawn into a wire of area of cross-section  $0.05 \text{ mm}^2$ . Calculate the resistance of this wire. Given density of nichrome  $8.4 \times 10^3 \text{ kgm}^{-3}$  and resistivity of the material as  $1.2 \times 10^{-6} \Omega\text{m}$ .
- 35) A circular coil of radius 10 cm and 25 turns is rotated about its vertical diameter with an angular speed of  $40 \text{ rad S}^{-1}$ , in a uniform horizontal magnetic field of magnitude  $5 \times 10^{-2}\text{T}$ . Calculate the emf induced in the coil. Also find the current in the coil if the resistance of the coil is  $15 \Omega$ .
- 36) In Young's double slit experiment the slits are separated by 0.28 mm and the screen is placed at a distance of 1.4 m away from the slits. The distance between the central bright fringe and the fifth dark fringe is measured to be 1.35 cm. Calculate the wavelength of the light used. Also find the fringe width if the screen is moved 0.4 m towards the slits, for the same experimental set up.

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- 37) Light of frequency  $8.41 \times 10^{14}$  Hz is incident on a metal surface. Electrons with their maximum speed of  $7.5 \times 10^5$  ms<sup>-1</sup> are ejected from the surface. Calculate the threshold frequency for photo emission of electrons. Also find the work function of the metal in electron volt (eV). Given Planck's constant  $h = 6.625 \times 10^{-34}$  JS and mass of the electron  $9.1 \times 10^{-31}$  Kg.
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