FIRST MODEL EXAMINATION

STD XII

PHYSICS

PAPER – 1

(THEORY)

(Maximum Marks: 70)

(Time allowed: Three hours)

(Candidates are allowed additional 15 minutes for only reading the paper.
They must NOT start writing during this time.)

All questions are compulsory.

This question paper is divided into 4 Sections, A, B, C and D as follows:

Section A

Question number 1 is of twelve marks All parts of this question are compulsory.

Section B

Question numbers 2 to 12 carry 2 marks each with two questions having internal choice.

Section C

Question numbers 13 to 19 carry 3 marks each with two questions having internal choice.

Section D

Question numbers 20 to 22 are long-answer type questions and carry 5 marks each.
Each question has an internal choice.

The intended marks for questions are given in brackets [ ].

SECTION A

*Answer **all** questions*

Question 1 [5X1]

(A) Choose the correct alternative (a) , (b) , (c) or (d) for each of the questions given below:

(i) What is the largest voltage you can safely put across a 98 ohm , 0.5W resistor?

(a) 7V (b) 70V (c) 0.7 V (d) 0.07 V

(ii) How will the magnetic field vector at the centre of a circular coil carrying current change if the current through the coil is doubled and the radius of the coil is halved ?

(a) increases two times (b) increases four times

(c) decreases to half (c) decreases to one fourth

iii) A fish which is at a depth of 16cm in water(n=4/3)is viewed by an observer on the bank of a lake. Its apparent depth as observed by the observer is

a) 18cm b) 9cm c)12cm d) 16cm

iv) The energy of an electron in the ground state of hydrogen atom is -13.6 eV. The first excitation energy is

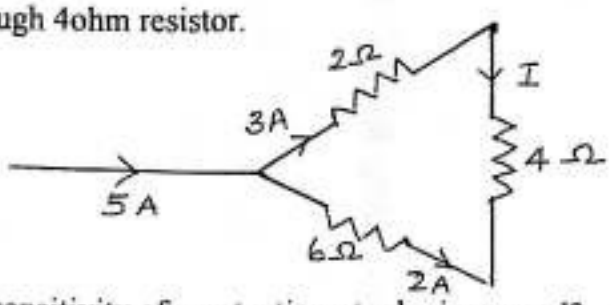
a) -13.6eV b)-3.4eV c) 10.2eV d) 13.6eV

v) When $_4Be^9$ is bombarded with an alpha particle, one of the products of the nuclear transformation is $_6C^{12}$. The other product is

a) $_{-1}e^0$ b) $_1H^1$ c) $_1D^2$ d) $_0n^1$

(B) Answer the following questions briefly and to the point. [7X1]

(i) A part of the electrical circuit is shown . Using Kirchoff's second law , find current flowing through 4ohm resistor.



(ii) How can the sensitivity of a potentiometer be increased?

(iii) Arrange the three types of magnetic materials , paramagnetic diamagnetic and ferromagnetic , in decreasing order of magnetic susceptibility .

(iv) What do you mean by wattles current ?

v) State one advantage of using reflecting telescope in place of a refracting telescope.

vi) Name the device used for voltage regulation.

vii) Write one balanced equation representing β^+ decay.

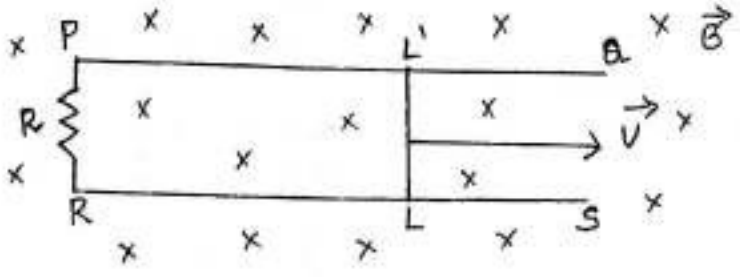
SECTION B

Question 2

Define drift velocity and derive the vector equation for Ohm's law. [2]

Question 3

Two parallel conductors PQ and RS, 1m apart in free space connected by a resistance R. They are placed in a magnetic field B perpendicular to the plane of the conductors. A wire LL' placed over it moves with a velocity v as shown . Calculate the work done per second(power) to slide the wire. [2]



OR

A motor has an armature resistance 5 ohm and takes 2 A current from a dc source of 100 V. When operating at the rated speed, find

1. Back emf 2. Power input 3. Power output 4. efficiency

Question 4

Define dielectric constant in terms of capacitance. Write down the expression for energy stored in a capacitor in terms of charge(Q) and capacitance(C). On a graph show how total energy stored in a capacitor varies with capacitance if charge remains constant. [2]

Question 5

Define temperature coefficient of material of a conductor. When a potential difference of 3V is applied between 2 ends of a 60cm long metallic wire, current density is found to be 10^{-7} A/m^2. Fine the conductivity of the material of the wire [2]

Question 6

i) What do you mean by displacement current?

ii) Name three vectors mutually perpendicular to each other during the propagation of em waves. [2]

Question 7

A convex lens has focal length 20cm and refractive index 1.5 . State the changes occur when it is placed in

i) medium of refractive index 1.4

ii) liquid of refractive index 1.6

Question 8

i) Define dispersive power of a prism.

ii) Refractive indices of red, yellow and violet are n_R=1.51, n_y=1.52 and n_v=1.53. Calculate its dispersive power. [2]

Question 9

i) What do you mean by de Broglie hypothesis?

ii) A proton and a duetron are accelerating under the same potential difference. Compare their de Broglie wavelengths. [2]

OR

i) Define threshold wavelength.

ii) An electromagnetic radiation of wavelength 620nm falls on a metal surface, whose work function is 1.2ev. Calculate the retarding potential required to stop the photo electric current.

Question 10

Draw energy level diagram for hydrogen atom showing at least five levels. Show the transitions responsible for Lyman absorption spectrum. [2]

Question 11

The binding energy per nucleon of nucleus X (A=240) is 7.6 MeV. It splits in to two nuclei Y and Z each of binding energy per nucleon 8.5 MeV and A=120. Calculate the amount of energy released. [2]

Question 12

Define i) Amplitude modulation ii) Modulation index

SECTION C

Question 13

Using Gauss's theorem derive the expression for electric field intensity(E) at a point distant r from the centre of a charged metallic sphere of radius R(R<r).

Draw a graph to show, how electric field intensity varies with distance

(1. Inside 2. Outside the charged metallic sphere.) [3]

Question 14

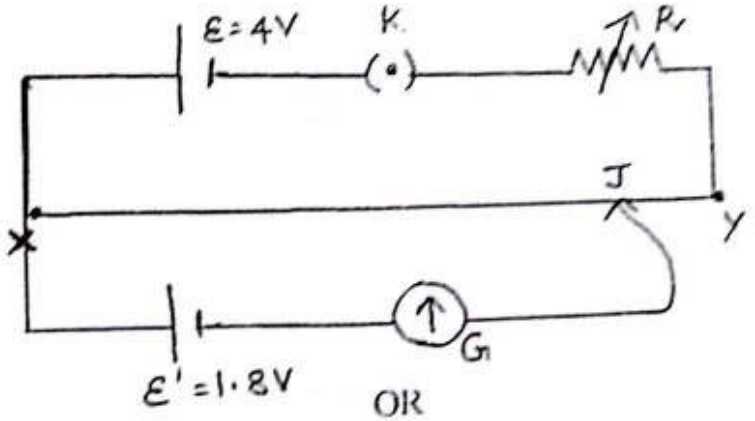
Derive the expression for capacitance of a parallel plate capacitor having charge Q, plate separation d and plate area A .

What happens to the capacitance, if a dielectric medium fills the space between the plates. [3]

Question 15

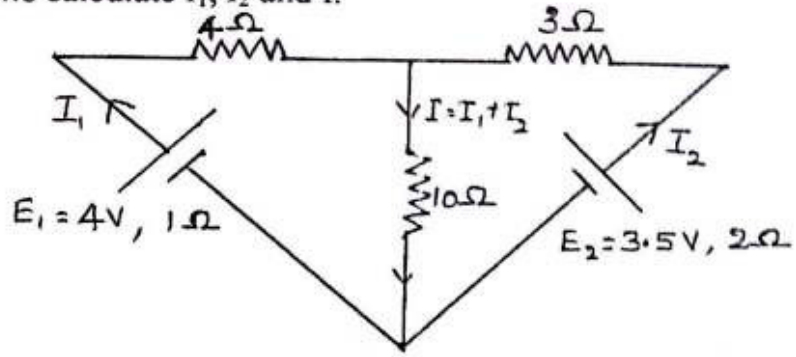
Figure shows a uniform wire XY of length 100cm , resistance 9 ohm connected to an accumulator of emf 4V and internal resistance 1ohm through a variable resistance R.

A cell of emf 1.8V is connected to the wire XY through a jockey J and centre zero galvanometer G. Galvanometer shows 0 deflection when XJ=80cm. Find the value of R. [3]



OR

Using Kirchoff's laws calculate I_1, I_2 and I.



Question 16

a) Derive Lens maker's formula for a thin lens. [3]

OR

b) With the help of a ray diagram derive mirror equation for a spherical mirror.

Question 17

State Huygen's wave theory. Using this theory verify laws of refraction of light. [3]

Question 18

i) Draw a graph showing the variation of activity of a radioactive substance with time.

ii) The half life of a radio active sample is 6h. If one starts with 640g of this sample, how much will be disintegrated in one day? [3]

Question 19

With the help of a neat circuit diagram, explain the working of a full wave rectifier. Illustrate its input and output wave forms. [3]

SECTION D

Question 20

1. Derive the expression for impedance in an LCR circuit. Draw the phasor diagram.

Write down the expression for instantaneous voltage and current.

2. What is meant by time constant in an LR circuit. When current flowing through a coil P decreases from 5A to 0 in 0.2s, an emf of 60V is induced across the terminals of an adjacent coil Q . Calculate coefficient of mutual induction of the two coils. [5]

OR

1. Obtain the expression for resonant frequency of an LCR series circuit.

What is phase difference between instantaneous current and voltage at resonance?

How much is the power factor of such a circuit.

2. When an alternating emf, e=300 $\sin(100\,\pi t + \frac{\pi}{6})$ is applied to a circuit, the current through it i

$i = 5\sin(100\,\pi t - \frac{\pi}{6})$. Find a) phase difference between emf and current.

b) average power consumed.

[5]

Question 21

a) i) Draw a labelled ray diagram of compound microscope with the final image at the least distance of distinct vision.

Ii) Derive an expression for its magnifying power.

iii) A convex lens of focal length 6.25cm is used as a magnifying glass. Calculate its magnifying power if it is in normal adjustment method.

[5]

OR

b) i) Draw a neat labelled diagram of an experimental set up of Young's double slit experimen study the interference of light. Obtain the expression for its fringe width.

ii) Show graphically the variation of intensity with distance of interference pattern.

Question 22

a) i) Draw the V-I characteristics of a diode. Indicate knee voltage and breakdown voltage on

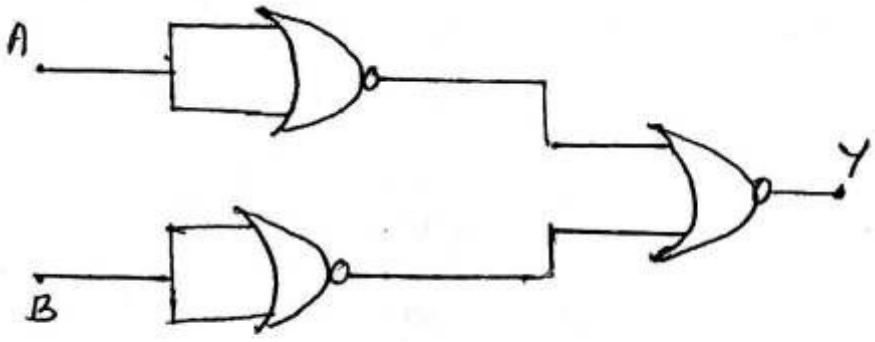
ii) With the help of a circuit diagram ,obtain the expression of current gain, voltage gain and power gain of a common emitter amplifier.

[5]

OR

b) i) For a common emitter transistor amplifier, the audio signal voltage across the collector resistance of 2.0kΩis 2.0V. The current amplification factor is 100, find the input signal voltage and base current ,if the base resistance is 1kΩ.

ii) Write the truth table of the following logic circuit and identify the logic gate represente by it.



iii) Distinguish between photodiode and solar cell.