HSE 11   PART -111 Physics

Reg No:....................   Time:2 Hours

Name   :....................   Maximum:60 Scores

General Instructions

(1).There is a 'cool off time' of 15 minutes in addition to the writing time. (2).You are not allowed to write your answers nor to discuss anything with others during the 'cool off time'. (3). Use the 'cool off time'to get familiar with questions and to plan your answers. (4).Read questions carefully before answering.

1.   The number of lines of force (Electric flux) emerging from +2 coulomb charge is_____   (1)

2.   Given the resistance of 1Ω, 2Ω & 3Ω, how will you combine them to get an equivalent resistance 6/11 Ω?   (1)

3   a)   Give the working principle of a metal detector.   (1)

     b)   Find out the power factor of a series LCR circuit at resonance.   (1)

4.   Arrange the following electro magnetic waves in the increasing order of wave length.

     UV, Radio waves, gammarays, microwaves, IR, X rays   (2)

5.   Construct the truth table of the given logic circuit with inputs 'A'and 'B'and output 'X'

X   (2)
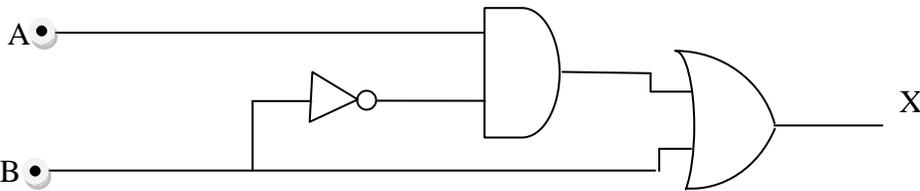
6.   Match the Following.

Velocity of light in vacuum	Gauss's theorem in magnetostatics
Diamagnetic	$1/\sqrt{μöεö}$
Orbital magnetic moment due to a revolving electron	Iron
Magnetic monopoles does not exist	Bohr Magneton
	Super Conductors

(4x½=2)

7. If the wavelength 'λ'of spectral lines emitted by hydrogen atom is generally expressed as

$\frac{1}{λ} = R \left(\frac{1}{m^2} - \frac{1}{n^2} \right)$

     Where R : Rydberg constant and 'n' and 'm' are integers. From this,

 a) Write down the expression for Balmer series of Spectral lines.   (1)

 b) Find out the shortest wavelength of spectral line emitted in Balmer Series.   (1)

8. Say True or False

    a) Equipotential surface through a point will be normal to the electricfield at that point.
    b) Work has to be done for moving a test charge from one point to other in an equipotential surface.
    c) No work has to be done for moving a test charge from one equipotential surface to another.
    d) Equipotential surfaces of a point charge form concentric spherical surfaces centred at charge (4x½=2)

9. A plane electromagnetic wave travells in vaccum along Z direction
    a) What can you say about the direction of electric and magnetic field vectors?   (1)
    b) If the frequency of the wave is 30 MHz, What is the wave length?   (1)

10. Draw the Symbolic representation of
    a) P-N junction diode
    b) Zener diode
    c) LED
    d) Photo diode   (2)

11. An audio signal 10 sin $\overline{2\wedge}$ (1500t) amplitude modulates a carrier 40 sin $2\overline{\wedge}$(100000t)
    a) Sketch the AM wave   (2)
    b) What will be the percentage of modulation?   (1)

OR

    At frequencies above 40 MHz communication is essentially limited to LOS paths.
      a) What does the term LOS communication mean?   (½)
      b) Give two examples of communication system that uses the above mode of propogation   (1)
      c) Calculate the area of region (Range) covered by the TV broadcast by a tower of height 200m.

      (Radius of earth R=6.4 x10^6 m)   (1½)

12. Photo electric effect occurs when light of suitable frequency incident on a metal surface
    a) What do you understand by the term 'workfunction' of a metal?   (1½)
    b) Write down Einstein's photo electric equation in terms of wavelength and hence express the
       the condition for photoelectric emission in terms of wave length.   (1½)

13. A photo diode is fabricated from a semiconductor of band gap energy 2ev
    a) Define band gap.   (1)
    b)Can this photodiode be used to detect a wavelength of 500nm? Justify your answer.   (2)

14. Two spectral lines are very close to each other.
    They are illuminated
                    i.   By using red colour of light and
                    ii.   By using violet colour of light
    a) A microscope is used to view the image in both case keeping all other conditions are same. Of these two
       colours of light (violet & red) which will help to view the image clearly? Explain.   (2)
    b) For given colour of light if the medium in between object (spectral lines) and objective lens of the of the
       microscope is replaced from air to glass, what will be the observation?   (2)

OR

    a)Show that F= R/2 in the case of concave mirror, where F is the focal length and R is the radius of curvature.
                                                                                                        (3)

    b)Two lens of powers +7D and – 3D are combined. The focal length of the combination would be
            a) -50cm b)+25cm c) -25cm d) +50cm   (1)

15.
   a) A galvanometer with a coil of resistance 120 Ω shows full scale deflection for a current of 2.5 mA. How will you convert the galvanometer into an ammeter of range 0 to 7.5 A ? (2)
   b) Determine the net resistance of the ammeter. (1)
   c) When an ammeter is put in a circuit, does it read slightly less or more than the actual current in the original circuit ? Justify your answer. (1)

16.   A capacitor is a system of two conductors separated by an insulator
   a) Write down the relation for the capacity of a parallel plate capacitor. (1)
   b) Obtain an expression for the energy stored in a capacitor. (3)

17.   Heavier nuclei are found to be unstable and such nuclei are radioactive.
   a) Write one example for radio active nucleus. (½)
   b) State the law of radioactive decay and derive $N = N_o e^{-\lambda t}$ (3)
   c) The half life of radioactive radon is 3.8 days. Find the time for which 1/20 of radon sample will remain undecayed. (1½)

18.
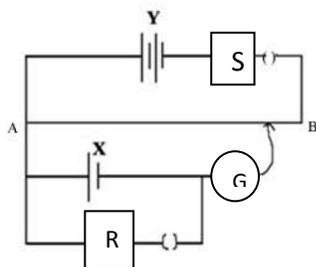
A boy performs an experiment on potentiometer using the circuit diagram shown above.
   a) How would the position of null point change if he
      I.   Increases the value of resistance S ? (1)
      II.   Decreases the value of resistance R ? (1)

   b) How this arrangement can be used to find out the internal resistance of the cell 'X' of emf 'E' ? (3)

19.   In the figure given below a bar magnet moving towards the right or left induces an emf in the coils (i) and (ii). a) Find giving reason, the directions of the induced currents through the resistors AB and CD when the magnet is moving.
   i.   Towards the right and
   ii.   Towards the left
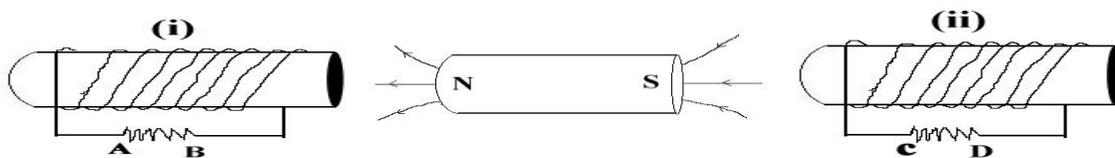
(2)
   b) Can we charge a capacitor using DC source? Explain. (1)
   c) A bulb is connected in series with a capacitor. Predict your observations
      (i)   For DC connection (1)
      (ii)   For AC connection (1)

20.   Consider refraction in a prism
   a) Draw the ray diagram to show the refraction. (1)
   b) Obtain an expression for the deviation of a ray of light. (2)
   c) What are the conditions to get minimum deviation? (2)
   d) What happens to minimum deviation when the prism is immersed in water? Explain. (1)