Total No. of printed pages = 8

APPLIED PHYSICS – II

(New Course)

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

PART – A

Marks – 25

All questions are compulsory.

1. Fill in the blanks :   1×9=9

   (a) For a convex lens when the object is between pole and focus, the image is at _____.

   (b) The focal length of a plane mirror is _____.

(c) The angle between the magnetic meridian and the geographic meridian is called _____.

(d) In an open circuit, the emf of a cell is _____ than the potential difference between the two terminals of the cell.

(e) When two condensers of capacities 10 μF and 20 μF are joined in series, their equivalent capacity is _____.

(f) Kilowatt-hour is the practical unit of _____.

(g) Photoelectric current increases with the increase in _____ of incident light.

(h) β–ray is nothing but the streams of _____.

(i) The diode is called a valve because of its _____ characteristics.

2. Choose the correct answer : 1×9=9

(a) Power of a concave lens of focal length 20 cm is

(i) –5D (ii) +5D

(iii) +20D (iv) –20D

(b) The velocity of light in solid is

    (i) maximum

    (ii) more than in air

    (iii) less than in air

    (iv) equal to that in air

(c) Two magnetic lines of force

    (i) are always parallel

    (ii) intersect each other

    (iii) do not intersect each other

    (iv) are never parallel

(d) A photoelectric cell converts

    (i) electrical energy into light energy

    (ii) light energy into heat energy

    (iii) light energy into electrical energy

    (iv) chemical energy into electrical energy

(e) The SI unit of resistivity is

    (i) ohm   (ii) ohm-m

    (iii) Cs-1   (iv) ampere

(f) Two parallel conductors carrying current in the opposite directions

    (i) attract each other

    (ii) repel each other

    (iii) does not affect each other

(g) The velocity of γ rays is

    (i) more than that of light

    (ii) same as that of light

    (iii) less than that of light

    (iv) can not compare with light

(h) A rectifier converts

    (i) AC to DC

    (ii) DC to AC

    (iii) low voltage to high voltage

    (iv) ammeter to voltmeter

(i) In an N type semiconductor majority charge carriers are

    (i) holes   (ii) electrons

    (iii) positrons   (iv) electron-hole pair

3. State whether the following statements are true or false : $1 \times 7 = 7$

(a) A convex mirror always produces a virtual image.

(b) When three resistances are connected in parallel, the equivalent resistance is less than each of the resistances.

(c) The refractive index of air is 1.

(d) X-rays are deflected by electric fields.

(e) Fiber optics works on the principle of photo-electric emission.

(f) A diode can be used as rectifier.

(g) A primary cell converts chemical energy to electrical energy.

PART – B

Marks – 45

Answer any *five* questions.

4. (a) Differentiate between a real and a virtual image.   2

(b) Deduce the relationship between the critical angle and refractive index.   2

(c) A ray of light is incident at an angle of $40°$ on one of the refracting surfaces of a prism and is refracted through the prism in the minimum deviation position. The angle of the prism is $50°$. Calculate the angle of minimum deviation and refractive index of the material of the prism.   3

(d) With a neat ray diagram show the virtual image formed by a concave mirror.   2

5. (a) What do you mean by terrestrial magnetism ? Name its elements.   2

(b) Define uniform magnetic field.   1

(c) In a hydrogen atom, the distance between the electron and proton is 5.3×10^{-11}m. Find the force of attraction between them. (charge on electron $= 1.6 \times 10^{-19}$C)   2

(d) Define electric potential. Deduce an expression for electrostatic potential at a point due to a. point charge. $1+3=4$

6. (a) What are the defects of a simple voltaic cell ? Explain in brief. 2

(b) Deduce an expression for equivalent capacity when three condensers of capacities C_1, C_2, C_3 are connected in series. 3

(c) What is the difference between a primary and a secondary cell ? 2

(d) A heating coil is designed to consume 1000 watts when connected to a 250 volts supply mains. Find the resistance of the coil. 2

7. (a) State Faraday's laws of electrolysis. What is electroplating ? $2+1=3$

(b) Explain electromagnetic induction. State Lenz's law. 2

(c) What is a transformer ? Explain the working of a step up transformer. $1+2=3$

(d) What are photoelectrons ? 1

8. (a) Calculate the frequency of a radiation whose photon has an energy 66.24 eV.

$(h = 6.624 \times 10^{-34}$ Js , 1 eV $= 1.6 \times 10^{-19}$ J)

2

(b) Convert 1 amu into eV. 2

(c) Write two uses of X-rays each in industry and in medical field. 2

(d) Write two properties each of α, β and γ radiations. 3

9. (a) Explain the principle of LASER. What is population inversion ? 2+1=3

(b) Explain how a triode is used as an amplifier ?

2

(c) With a neat diagram show how an N type semiconductor is formed. 2

(d) What is LED ? Explain its working principle.

1+1=2