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END SEMESTER EXAMINATION-2022

Semester : 2nd

Branch : All

Subject Code : Sc-204

APPLIED PHYSICS-II

Full Marks – 70

Time – Three hours

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

Instruction :

All questions of PART-A and PART-B are compulsory.

PART-A

Marks--25

1 Choose the correct answer of each of the following :

1×10=10

(a) The image formed by a plain mirror is

(i) virtual

(ii) erect

[Turn over

- (iii) same size as the object
 - (iv) All of these
- (b) The principle behind optical fibers is
- (i) refraction (ii) dispersion
 - (iii) scattering (iv) total internal reflection
- (c) The permeability of air is
- (i) 1 (ii) 1.5
 - (iii) 0.5 (iv) infinite
- (d) A magnet of moment M is suspended in a uniform magnetic field B . The maximum value of torque acting on the magnet is
- (i) MB (ii) $\frac{1}{2} MB$
 - (iii) $2MB$ (iv) Zero
- (e) The direction of electric current is from
- (i) positive end to the negative end of the cell
 - (ii) negative end to the positive end of the cell
 - (iii) Both (i) and (ii) is possible
 - (iv) None of the above

(f) When voltage of 20V is applied across a wire, a current of 0.05A flows through it. The resistance of the wire is

- (i) 40Ω (ii) 400Ω
- (iii) 10Ω (iv) $2.5 \times 10^{-3}\Omega$

(g) Which of the following law deals with the process of electrolysis ?

- (i) Ohm's law (ii) Joule's law
- (iii) Faraday's law (iv) Kirchhoff's law

(h) The material of the heating element of an electric heater should have

- (i) high resistivity and high melting point
- (ii) low resistivity and high melting point
- (iii) low resistivity and low melting point
- (iv) high resistivity and low melting point

(i) Iron is used as a core in transformer since it has

- (i) high density (ii) high permeability
- (iii) strong enough (iv) All the above three

(j) The variable that varies directly with the amount of current produced by photo-electrons is

- (i) the intensity of the incident light
- (ii) the frequency of the incident light
- (iii) the wavelength of the incident light
- (iv) the work function of the metal surface

2 Fill in the blanks :

$1 \times 8 = 8$

- (a) A lens has a power specification of +4D, the type of the lens is ____.
- (b) The surest test for magnification is ____.
- (c) Electron volt is the unit of ____.
- (d) The reciprocal of resistance is called ____.
- (e) Between alloys and pure metals, ____ are preferred to be used in electrical appliances.
- (f) In Fleming's right hand rule, the middle finger shows the direction of ____.
- (g) Equivalent energy of 10 mg mass is ____ Joule
- (h) At absolute temperature, a semiconductor behaves like ____.

3. Write true or false :

1×7=7

- (i) Twinkling of stars occur due to atmospheric refraction.
- (ii) An electric circuit is a continuous path through which electric current can flow.
- (iii) Electroplating is a process based on heating effect of current.
- (iv) A laser produces a beam of monochromatic incoherent light
- (v) An element ${}_Z X^A$ is converted into ${}_{Z+1} Y^A$ due to a radioactive transformation. The process is called β -emission.
- (vi) For full wave rectification the minimum number of diodes used is three (3).
- (vii) Semiconductors, both P-type and N-type are produced by covalent solids.

PART-B

Marks-45

4. (a) What is an optical image? With neat ray diagram show how a virtual image be formed by a concave mirror.

1+2=3

Or

What is angle of deviation ? Explain why diamond dazzles. $1+2=3$

- (b) What is an acceptance angle and numerical aperture in optical fibers ?

A divergent lens of focal length equal to 30 cm produces an image of an object of height 4 cm placed at a distance of 15 cm in front of the lens. Find the position of the image. $1+2=3$

- (c) Define permeability of substance. 1

- (d) Why two magnetic lines of force can not intersect with each other ? The value of dip at a place is 60° . Find the value of the total intensity of earth's field if $H = 3.6 \times 10^{-5} \text{ T}$.

$1+1=2$

5. (a) Define one Coulomb charge. A parallel plate capacitor has a capacitance of $50 \mu\text{F}$ in air and $100 \mu\text{F}$ when immersed in oil. What is the dielectric constant K of the oil ? $1+1=2$

- (b) Define electric potential. Mention the factors affecting the capacity of a capacitor. $1+1=2$

Or

State Coulomb's law of electro-static. 'Coulomb's force is a central force'. State the reason of this statement.

(c) What is an electric cell ? How the defects of cell are removed in Leclanche cell ? 1+2=3

(d) State Joule's law of heating effect. An electric lamp marked 50W is worked on 220V mains. Find the current passing through it.

1+1=2

6. (a) State Kirchhoff's voltage law. The specific resistance of copper wire is 1.7×10^{-4} ohm-cm, the radius of the wire is 1mm. Calculate the length of wire needed for having a resistance of 10.5 ohm.

1+3=4

(b) What is Peltier effect? On what factors neutral temperature and temperature of inversion depends ?

1+2=3

Or

State Second law of electrolysis. Describe the action at anode in a copper voltammeter.

(c) State Faraday's laws of electromagnetism. 2

7. (a) State Lenz's law. Explain in brief that magnetic force acting on a charge does not work.

1+2=3

(b) 1000 watt power is supplied to 200 turn primary of a transformer at 500mA. The secondary gives 220 volt. Find the numbers of turns in the secondary.

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- (c) Define population inversion. If X is the threshold frequency and the frequency of the incident light increases from $2x$ to $4x$. Find the resulting current of photoelectrons.

$$1+1=2$$

- (d) The maximum kinetic energy of photoelectrons emitted from a surface when photon of energy 6eV falls on it is 4eV . Calculate the stopping potential.

$$2$$

8. (a) Write two industrial uses of X-Rays. Differentiate between spontaneous and stimulated emission.

$$2+2=4$$

- (b) What is an extrinsic semiconductor ?

An LED is constructed from a PN junction based on a certain semi-conducting material whose energy gap is 1.9 eV . Calculate the wavelength of emitted light.

$$1+4=5$$

Or

What is forbidden energy gap ?

Explain the use of p-n junction diode as a half-wave rectifier.