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Sc-204/AP-II/2nd-Sem/Comm/2017/M

## APPLIED PHYSICS – II

Full Marks – 70

Pass Marks – 21

Time – Three hours

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

Answer question Nos.1 and 2 and any six from the rest.

1. Fill in the blanks : 5×1=5
- (a) The power of convex lens of focal length 25 cm is \_\_\_\_\_ .
- (b)  $\alpha$  rays have \_\_\_\_\_ charge.
- (c) The number of photo-electrons emitted depends upon the \_\_\_\_\_ of incident wave.
- (d) The number of protons in  ${}_{92}\text{U}^{238}$  is \_\_\_\_\_.
- (e) An electric cell converts \_\_\_\_\_ energy to \_\_\_\_\_ energy.

[Turn over

2. Choose the correct answers :  $5 \times 1 = 5$

(a) The focal length of a plane mirror is —

- (i) zero
- (ii) negative
- (iii) infinity
- (iv) none of the above.

(b) Light of wavelength  $30000 \text{ \AA}$  has frequency

- (i)  $3 \times 10^5 \text{ Hz}$
- (ii)  $10^{10} \text{ Hz}$
- (iii)  $10^{15} \text{ Hz}$
- (iv)  $3 \times 10^{10} \text{ Hz}$

(c) A convex mirror slices an image which is

- (i) real and inverted
- (ii) real and erect
- (iii) virtual and inverted
- (iv) virtual and erect.

(d) Three condensers each of capacity  $5 \mu\text{F}$  are connected in series. The equivalent capacity is

- (i)  $15 \mu\text{F}$
- (ii)  $\frac{5}{3} \mu\text{F}$
- (iii)  $\frac{3}{5} \mu\text{F}$
- (iv)  $5 \mu\text{F}$

(e) The majority of charge carriers in an N-type semi-conductor is

(i) holes

(ii) electrons

(iii) protons

(iv) photons

3. (a) Distinguish between a real and a virtual image. 2

(b) With a neat ray diagram, show how a virtual image may be formed by a concave mirror. 2

(c) An object of size 10 cm is placed at a distance of 30 cm in front of a convex mirror of radius of curvature 40 cm. Find the position, nature and size of the image. 4

(d) Define power of a lens. 2

4. (a) State the conditions for total internal reflection. Define critical angle. 2+1=3

(b) What are the elements of terrestrial magnetism? Explain each one. 3

(c) State and explain tangent law in magnetism. 3

(d) What is a reinform magnetic field? 1

5. (a) State Coulomb's law of electrostatics. Hence define unit charge. 2+1=3
- (b) State and explain the principle of a condenser. 3
- (c) Deduce an expression for electrostatic potential at a point due to a point charge. 3
- (d) What is a secondary cell ? 1
6. (a) Find an expression for current in a circuit when n number of cells are connected in series. 3
- (b) Define specific resistance and give its unit. 2
- (c) What is the effect of temperature on resistance ? 2
- (d) The difference of potential between the two terminals of cell in open circuit is 2.2 volt. This difference reduces to 2 volts when the terminals are connected by a resistance 4 ohms. What is the internal resistance of the cell ? 3



7. (a) Derive an expression for the equivalent resistance of a number of resistances connected in parallel. 3

(b) Convert 1 kilowatt-hr into joules. 2

(c) A 3000 watt electric heater is connected to 240 volt main supply. Calculate the current in the circuit and the resistance of the heater. 3

(d) What is Seebeck effect ? Explain. 2

8. (a) State Faraday's laws of electromagnetic induction. 3

(b) Define self and mutual induction. 2

(c) Photo-electrons are emitted by a sodium surface when UV light of wavelength  $3 \times 10^{-8} \text{m}$  fall on its surface. Calculate the velocity of photo-electrons assuming the work function of sodium to be negligible.

Here mass of electron =  $9.1 \times 10^{-31} \text{ kg}$ ,

Plank's constant =  $6.6 \times 10^{-34} \text{ J-S}$ . 4

(d) What do you understand by atomic mass unit ? 1

9. (a) State two properties each of  $\alpha$ ,  $\beta$  and  $\gamma$  radiations. 2

(b) Why the diode is called a valve ? How the diode is used as a full-wave rectifier ?  
1+3=4

(c) With a neat diagram, show how a P-type semi-conductor is formed. 2

(d) Explain intrinsic and extrinsic semi-conductors with examples. 2

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