Total No. of printed pages = 6

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) r rays have ——— charge.

   (c) The number of photo-electrons emitted depends upon the ——— of incident wave.

   (d) The number of protons in $_{92}U^{238}$ is ———.

   (e) An electric cell converts ——— energy to ——— energy.

[Turn over

2. Choose the correct answers : $5\times1=5$

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

(i) zero

(ii) negative

(iii) infinity

(iv) none of the above.

(b) Light of wavelength 30000Å has frequency

(i) 3×10^5 Hz (ii) 10^{10} Hz

(iii) 10^{15} Hz (iv) 3×10^{10} 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 5μF are connected in series. The equivalent capacity is

(i) 15μF (ii) $\frac{5}{3}$ μF

(iii) $\frac{3}{5}$ μF (iv) 5μF

(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 3×10^{-8}m fall on its surface. Calculate the velocity of photo-electrons assuming the work function of sodium to be negligible.

Here mass of electron = $9{\cdot}1\times10^{-31}$ kg,

Plank's constant = $6{\cdot}6\times10^{-34}$ J-S. 4

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

9. (a) State two properties each of α, β and γ 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