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BAS 3202

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Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 39907 Roll No. 1220440038

B. Tech. Examination 2022-23

(Even Semester)

PHYSICS - II

Time : Three Hours] *[Maximum Marks : 60*

Note :– Attempt all questions.

SECTION–A

1. Attempt all parts of the following : 8×1=8

   (a) What do you mean by wave function?

   (b) Describe Bragg's law.

   (c) Show that De-Broglie wavelength of an electron accelerated through a potential difference of V volts is given by :

$$\frac{12.28}{\sqrt{V}} \text{ Å}$$

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(d) Write down Maxwell's equations in differential form.

(e) What are Cooper pairs?

(f) What do you mean by face-centred cubic lattice?

(g) What do you mean by SEM?

(h) Define skin depth.

SECTION – B

2. Attempt any two parts of the following : $2 \times 6 = 12$

(a) Calculate the velocity and kinetic energy of a neutron having De-Broglie wavelength 1 Å.

(b) The lattice constant for a unit cell of aluminium is 4.049 Å. Calculate the spacing of (220).

(c) If earth receives 2 cal min^{-1} cm^{-2} solar energy, what are the amplitudes of electric and magnetic fields of radiation?

(d) A super conducting lead has critical temperature of 6.2 K and critical magnetic field of 0.0306 T at OK. Determine the critical magnetic field at 3.1 K.

SECTION – C

Note :– Attempt all questions. Attempt any two parts from each question. 5×8=40

3. (a) What are matter waves? Show that De-Broglie wavelength associated with a particle of mass 'm' and kinetic energy 'E' is given by :

$$\lambda = \frac{h}{\sqrt{2mE}}$$

(b) What doyou meanby group velocity and phase velocity of a wave packet? Show that :

$$v_p \times v_g = c^2$$

(c) Derive time independent Schrodinger wave equation.

4. (a) Describe the diamond crystal structure and calculate the packing factor of diamond.

(b) Describe Laue's experiment for diffraction of X-rays. What are the outcomes of Laue's experiment.

(c) What is poynting vector? Discuss the poynting theorem for the flow of energy in electro-magnetic field.

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5. (a) Describe bucky balls. Discuss their properties and uses.

(b) What are super-conductors? Describe Meissner effect in super-conductors.

(c) What are type I and type II super conductors?

6. (a) Prove that the velocity of plane electro-magnetic wave in free space is given by :

$$C = \frac{1}{\sqrt{\mu_0 \in_0}}$$

(b) What is Heisenberg uncertainty princple? Apply this to prove the non-existence of electron inside the nucleus.

(c) What do you mean by inter planar distance? Show that in a cubic lattice the distance between successive planes having Miller indices (h k ℓ) is given by :

$$d_{hk\ell} = \frac{a}{\sqrt{h^2 + k^2 + \ell^2}}$$

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