Hall Ticket No | | | | | | | | | | | Question Paper Code: AHSD07

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

B.Tech I SEMESTER END EXAMINATIONS (REGULAR) - FEBRUARY 2024
Regulation: BT23
APPLIED PHYSICS

Time: 3 Hours **(COMMON TO CSE | CSE (CS) | CSE (DS))** **Max Marks: 60**

Answer ALL questions in Module I and II
Answer ONE out of two questions in Modules III, IV and V
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

MODULE – I

1. (a) What is packing fraction? Show that FCC is most closely packed of the three cubic structures by working out the packing factors. [BL: Understand| CO: 1|Marks: 6]

   (b) Sketch (0 0 1), (1 1 0) and (1 1 1) planes for a cubic crystal. Calculate the interplanar distance for (3 2 1) plane in simple cubic lattice with interatomic spacing equal to 4.12 Å
   [BL: Apply| CO: 1|Marks: 6]

MODULE – II

2. (a) What is the de-Broglie concept of matter waves? On the basis of Planck's and Einstein's theory of radiation, derive an expression for de-Broglie wavelength [BL: Understand| CO: 2|Marks: 6]

   (b) An electron is trapped in a one dimensional region of length 4 Å. How much energy must be supplied to excite the electron from the ground state to the second excited state? (Planck's constant $= 6.63 \times 10^{-34}$ Js and Mass of electron $= 9.11 \times 10^{-31} kg$) [BL: Apply| CO: 2|Marks: 6]

MODULE – III

3. (a) Mention the characteristics of lasers. Describe with suitable diagram, principle and working of He-Ne laser system. [BL: Understand| CO: 3|Marks: 6]

   (b) Calculate how many photons are emitted in each minute in a He-Ne laser source which emits light at a wavelength of 6328Å. The output power of this source is 3mW.
   [BL: Apply| CO: 3|Marks: 6]

4. (a) Obtain an mathematical expression of numerical aperture with appropriate ray diagram.
   [BL: Understand| CO: 4|Marks: 6]

   (b) Calculate the numerical aperture and hence the acceptance angle for an optical fiber kept in an air medium whose core and cladding have a refractive index of 1.45 and 1.40 respectively
   [BL: Apply| CO: 4|Marks: 6]

MODULE – IV

5. (a) Demonstrate type-I and type-II superconductors with suitable diagrams. Prove that the susceptibility of superconductor is -1. [BL: Understand| CO: 5|Marks: 6]

(b) The superconducting transition temperature of lead of 7.26K. The initial field at 0K is 64×10^3 Amp m^{-1}. Calculate the critical field at 5 K. [BL: Apply| CO: 5|Marks: 6].

6. (a) Elucidate hysteresis in ferromagnetic materials. Discuss about the origin of magnetic moment in detail. [BL: Understand| CO: 5|Marks: 6]

(b) A magnetic field of 2000 Am^{-1} is applied to a material which has a susceptibility of 1000. Calculate

i) Relative permeability of the material

ii) Magnetization

iii) Flux density. [BL: Apply| CO: 5|Marks: 6]

MODULE – V

7. (a) With neat diagram, explain fabrication of nano-materials by using chemical vapour deposition method. [BL: Understand| CO: 6|Marks: 6]

(b) An X-ray beam of wavelength $3A^0$ is diffracted from (1 0 0) plane of a cubic crystal. The first order maximum is obtained for glancing angle of 40^0. Determine the space of the reflecting plane and also the volume of the unit cell. [BL: Apply| CO: 6|Marks: 6]

8. (a) Write the synthesis of nanomaterials by sol gel method. Discuss the application of nanomaterials. [BL: Understand| CO: 6|Marks: 6]

(b) Monochromatic X-rays of wavelength λ= 1.5 AU are incident on a crystal face having an interplanar spacing of 1.6 AU. Find the highest order for which Bragg's reflection maximum can be seen. [BL: Apply| CO: 6|Marks: 6]

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