

Hall Ticket No

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Course Code: AHSD07



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

B.TECH I SEMESTER CIE – II EXAMINATIONS, JANUARY – 2024

Regulation: BT23

APPLIED PHYSICS

Time: 2 Hours

(COMMON TO CSE | CSE(DS) | CSE(CS))

Max Marks: 20

Answer any FOUR questions

All parts of the question must be answered in one place only

- (a) Illustrate graded index optical fiber with a neat figure and explain the transmission of signal through it. [BL: Understand| CO: 4|Marks: 2]

(b) An optical fiber has a numerical aperture of 0.02 and a cladding refractive index of 1.59. Solve the value of acceptance angle for the fiber in water which has a refractive index of 1.33.

$$\sin \alpha = \sin^{-1} \left(\frac{NA}{n_0} \right)$$
 [BL: Apply| CO: 4|Marks: 3]
- (a) Describe in detail about the magnetic permeability, relative permeability, intensity of magnetization and magnetic susceptibility. [BL: Understand| CO: 5|Marks: 2]

(b) If a magnetic field of strength 300 amp/meter produces a magnetization of 4200 A/m in a ferromagnetic material, find the relative permeability of the material.

$$\mu_r = \frac{\mu}{\mu_0}$$
 [BL: Apply| CO: 5|Marks: 3]
- (a) Explain the various properties and important applications of superconducting materials. [BL: Understand| CO: 5|Marks: 2]

(b) A superconducting Tin has critical temperature of 3.7k at zero magnetic field and critical field of 0.0306 A/m at 0 k. Find critical field at 2 k. Find critical current also if $r = 1$ m.

$$\mu_c = \mu_0 \left(1 - \frac{T}{T_c} \right) \quad I = 2\pi r H_c$$
 [BL: Apply| CO: 5|Marks: 3]
- (a) Discuss with neat sketch how the nanoparticles are prepared employing the bottom- up method namely sol-gel? [BL: Understand| CO: 6|Marks: 2]

(b) Calculate average particle size using X-ray diffraction pattern having 0.1541 nm of X-ray wavelength, 0.011 radian of full width and half maximum and diffraction angle of 45° . [BL: Apply| CO: 6|Marks: 3]
- (a) Why surface area/volume ratio is very large for nanoparticles compared to bulk materials? Explain with an example. [BL: Understand| CO: 6|Marks: 2]

(b) Monochromatic X-rays of wavelength $\lambda = 1.5$ 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.

$$n\lambda = 2d \sin \theta$$
 [BL: Apply| CO: 6|Marks: 3]

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