Subject Code-: R10103/R10 **Set No - 1**

I B.Tech I Semester Supplementary Examinations June - 2012

ENGINEERING PHYSICS - I

(Common to All Branches)

Time: 3 hours **Max. Marks : 75**

Answer any FIVE Questions
All Questions carry equal marks
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1.(a) Give the conditions for producing good interference fringes.
(b) Explain with theory, the Newton's rings method to determine the wavelength of monochromatic light.
(c) In Newton's rings experiment, the diameter of the 15^{th} ring was found to be 0.59 cm and that of the 5^{th} ring was 0.336 cm. If the radius of the plano convex lens is 100 cm, compute the wavelength of light used.

[3M + 8M + 4M]

2.(a) What is diffraction grating? Explain with necessary theory, the Fraunhofer diffraction due to 'n' slits.
(b) Calculate the maximum number of orders possible for a plane diffraction grating.

[12M + 3M]

3.(a) What is Malus' law? What is Brewster's law? Prove that the angle between reflected and refracted beams is 90^0, if the angle incidence corresponds to Brewster's angle.
(b) The refractive index of calcite for ordinary ray is 1.658 and for extra ordinary ray it is 1.486. The slice having the thickness $0.9\text{x}10^{-4}$ cm is cut from the crystal. For what wavelength this slice acts as half wave plate?

[11M + 4M]

4.(a) Define Coordination Number, Nearest Neighbor Distance, Atomic Radius and Packing Fraction.
(b) Obtain the relation between the edge of the unit cell and atomic radius for SC, BCC and FCC lattices.
(c) Chromium has BCC structure. Its atomic radius is 0.1249 nm. Calculate the free volume per unit cell.

[4M + 7M + 4M]

5.(a) State and explain Bragg's law of X-ray diffraction.
(b) Describe with suitable diagram, the powder method for determination of crystal structure.
(c) The Bragg's angle for reflection from the (1 1 1) plane in FCC crystal is 19.2^o for an X-ray wavelength of 1.54Å. Compute the cube edge of the unit cell.

[3M + 8M + 4M]

6.(a) Explain the characteristics of Laser beam.
(b) What are the necessary conditions for lasing action?
(c) What are Einstein coefficients? Derive the relation between them.

[4M + 3M + 8M]

7.(a) What is an Optical fiber? Describe different types of fibers by giving the refractive index profiles and propagation details.
(b) The numerical aperture of an optical fiber is 0.39. if the difference in refractive index of the material of its core and cladding is 0.05, calculate the refractive index of material of the core.

[11M + 4M]

8.(a) Explain the working of Ultrasonic flaw detector.
(b) Explain three different and most common types of scans used in Ultrasonic inspection.

[6M + 9M]

Subject Code-: R10103/R10 **Set No - 2**

I B.Tech I Semester Supplementary Examinations June - 2012

ENGINEERING PHYSICS - I

(Common to All Branches)

Time: 3 hours **Max. Marks : 75**

Answer any FIVE Questions
All Questions carry equal marks
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1.(a) Discuss the phenomenon of interference in thin films. Obtain the conditions for maxima and minima.
(b) Why an extremely thin film appears black in reflected light?
(c) Calculate the thickness of a soap film ($\mu = 1.463$) that will result in constructive interference in the refected light, if the film is illuminated normally with light whose wavelength in free space is 6000Å.

[8M + 3M + 4M]

2.(a) What is diffraction? Explain clearly the differences between interference and diffraction.
(b) Obtain the condition for primary maxima in Fraunhofer diffraction due to single slit and derive an expression for width of the central maxima.

[5M + 10M]

3.(a) What is Malus' law? What is Brewster's law? Prove that the angle between reflected and refracted beams is 90^0, if the angle incidence corresponds to Brewster's angle.
(b) The refractive index of calcite for ordinary ray is 1.658 and for extra ordinary ray it is 1.486. The slice having the thickness 0.9×10^{-4} cm is cut from the crystal. For what wavelength this slice acts as half wave plate?

[11M + 4M]

4.(a) Explain the terms 'lattice', 'basis' and 'unit cell'.
(b) Estimate the fraction of total volume occupied by atoms in BCC and FCC structures.
(c) Derive the expression for density of the crystal in terms of lattice constant.

[3M + 8M + 4M]

5.(a) What are Miller Indices? What are their important features?
(b) Calculate the ratio $d_{100} : d_{110} : d_{111}$ for simple cubic structure.
(c) Sketch the following planes of the cubic unit cell: (110), (111), and ($\bar{1}21$).

[5M + 4M + 6M]

6.(a) Explain the characteristics of Laser beam.
(b) What are the necessary conditions for lasing action?
(c) What are Einstein coefficients? Derive the relation between them.

[4M + 3M + 8M]

7.(a) Explain Acceptance angle and derive expression for it.
(b) Write notes on Step Index and Graded Index fibers.
(c) For an optical fiber fractional index change is 0.14 and refractive index of cladding is 1.3. Calculate refractive index of core.

[5M + 6M + 4M]

8.(a) Explain different types of scans in NDT.
(b) Explain various applications of ultrasonic testing.

[8M + 7M]

Set No - 3

Subject Code-: R10103/R10

I B.Tech I Semester Supplementary Examinations June - 2012

ENGINEERING PHYSICS - I

(Common to All Branches)

Time: 3 hours **Max. Marks : 75**

Answer any FIVE Questions
All Questions carry equal marks
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1.(a) Explain the principle of Superposition of waves.
(b) Obtain an expression for fringe width in case of Young's double slit experiment. In this case of interference, prove that the dark and the bright bands are of equal width.
(c) Distance between the slits is 0.1 mm and the width of fringes formed on the screen is 5 mm. What would be the wavelength of light used, if the distance between the screen and the slit is one meter?
[3M + 8M + 4M]

2.(a) What is diffraction grating? Explain with necessary theory, the Fraunhofer diffraction due to 'n' slits.
(b) Calculate the maximum number of orders possible for a plane diffraction grating.
[12M + 3M]

3.(a) Explain the phenomenon of double refraction. How can it be used to produce a plane polarized light?
(b) Describe the construction of Nicol prism.
(c) Refractive index of water is 1.33. Calculate the angle of polarization for light reflected from the surface.
[6M + 5M + 4M]

4.(a) Define Coordination Number, Nearest Neighbor Distance, Atomic Radius and Packing Fraction.
(b) Obtain the relation between the edge of the unit cell and atomic radius for SC, BCC and FCC lattices.
(c) Chromium has BCC structure. Its atomic radius is 0.1249 nm. Calculate the free volume per unit cell.
[4M + 7M + 4M]

5.(a) What are Miller Indices? What are their important features?
(b) Calculate the ratio $d_{100} : d_{110} : d_{111}$ for simple cubic structure.
(c) Sketch the following planes of the cubic unit cell: (110), (111), and ($\bar{1}21$).
[5M + 4M + 6M]

6.(a) Explain the purpose of an active medium in a laser.
(b) With the help of suitable diagram, explain the principle, construction and working of a He-Ne laser.
(c) Calculate the wavelength of emitted radiation from GaAs which has a band gap of 1.44 ev.
[3M + 8M + 4M]

7.(a) What is an Optical fiber? Describe different types of fibers by giving the refractive index profiles and propagation details.

(b) The numerical aperture of an optical fiber is 0.39. if the difference in refractive index of the material of its core and cladding is 0.05, calculate the refractive index of material of the core.

[11M + 4M]

8.(a) Explain different types of scans in NDT.

(b) Explain various applications of ultrasonic testing.

[8M + 7M]

Subject Code-: R10103/R10 **Set No - 4**

I B.Tech I Semester Supplementary Examinations June - 2012

ENGINEERING PHYSICS - I

(Common to All Branches)

Time: 3 hours **Max. Marks : 75**

Answer any FIVE Questions
All Questions carry equal marks
*** * * * ***

1.(a) Give the conditions for producing good interference fringes.
(b) Explain with theory, the Newton's rings method to determine the wavelength of monochromatic light.
(c) In Newton's rings experiment, the diameter of the 15^{th} ring was found to be 0.59 cm and that of the 5^{th} ring was 0.336 cm. If the radius of the plano convex lens is 100 cm, compute the wavelength of light used.
[3M + 8M + 4M]

2.(a) What is Rayleigh Criterion of resolution?
(b) Derive the expression for resolving power of grating.
(c) A diffraction grating having 4000 lines/cm is illuminated normally by light of wavelength 5000Å. Calculate its resolving power in the third order spectrum.
[3M + 8M + 4M]

3.(a) Distinguish between plane, circularly and elliptically polarized lights.
(b) Write notes on quarter and half wave plates.
(c) Find the thickness of the half wave plate, when the wavelength of light is equal to 5890Å, $\mu_0 = 1.55$ and $\mu_e = 1.54$.
[5M + 6M + 4M]

4.(a) Explain the terms 'lattice', 'basis' and 'unit cell'.
(b) Estimate the fraction of total volume occupied by atoms in BCC and FCC structures.
(c) Derive the expression for density of the crystal in terms of lattice constant.
[3M + 8M + 4M]

5.(a) State and explain Bragg's law of X-ray diffraction.
(b) Describe with suitable diagram, the powder method for determination of crystal structure.
(c) The Bragg's angle for reflection from the (1 1 1) plane in FCC crystal is 19.2^o for an X-ray wavelength of 1.54Å. Compute the cube edge of the unit cell.
[3M + 8M + 4M]

6.(a) Explain the purpose of an active medium in a laser.
(b) With the help of suitable diagram, explain the principle, construction and working of a He-Ne laser.
(c) Calculate the wavelength of emitted radiation from GaAs which has a band gap of 1.44 ev.
[3M + 8M + 4M]

7.(a) Explain Acceptance angle and derive expression for it.
(b) Write notes on Step Index and Graded Index fibers.
(c) For an optical fiber fractional index change is 0.14 and refractive index of cladding is 1.3. Calculate refractive index of core.
[5M + 6M + 4M]

8.(a) Explain the basic principle of ultrasonic testing
(b) What are the advantages and limitations of ultrasonic testing?
[5M + 10M]