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Set No. 1

Code No: R10103 / R10

I B.Tech I Semester Regular/Supplementary Examinations January 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) What is interference of light waves? What are the conditions necessary for obtaining interference fringes?
(b) Describe Young's double slit experiment and obtain an expression for fringe width.
(c) Two narrow and parallel slits 0.08 cm apart are illuminated by light of frequency $8x\ 10^{11}$ kHz. It is desired to have a fringe width of $6x10^{-4}$ m. Where the screen should be placed from the slits?

[5M + 6M + 4M]

2.(a) What are the differences between interference and diffraction.
(b) Describe the Fraunhofer diffraction pattern obtained with single slit.
(c) A plane transmission grating having 4250 lines per cm is illuminated with sodium light normally. In second order spectrum the spectral lines are deviated by 30^{o} are observed. Find the wavelength of the spectral line.

[4M + 7M + 4M]

3.(a) What are the quarter and half wave plates?
(b) Derive the expressions for thickness of quarter and half wave plates.
(c) Plane polarized light passes through a quartz plate with its axis parallel to the face. Calculate the thickness of the plate so that the emergent light may be plane polarized. For quartz $\mu_e = 1.553$, $\mu_o = 1.542$; $\lambda = 5.5x10^{-5}$ cm.

[3M + 8M + 4M]

4.(a) Define crystal lattice, unit cell, lattice parameter and coordination number.
(b) Describe the FCC crystal structure and obtain the expression for its packing factor.
(c) Iron has BCC structure below 910 ^{o}C and is FCC structure above 910 ^{o}C. The atomic radius of an atom is the same in both the cases. Calculate the ratio of the packing densities of bulk iron in the two structures at below 910 ^{o}C.

[4M + 7M + 4M]

5.(a) Define Miller indices for designating
(i) direction, (ii) plane, (iii) family of directions and (iv) family of planes.
(b) Sketch the (1 0 2) and (0 1) planes in a cubic unit cell.
(c) Derive an expression for inter planar distance between parallel planes (h k l).

[4M + 4M + 7M]

6.(a) What are the characteristics of a laser beam?
(b) Describe the construction and working of He-Ne laser.

[5M + 10M]

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Code No: R10103 / R10

Set No. 1

7.(a) What is the principle behind the functioning of an optical fiber?
(b) Discuss various factors contributing to attenuation in optical fibers.
(c) The optical power launched into an optical fiber is 1.5 mW. The fiber has attenuation of 0.5 db/km. If the power output is 2 μm, calculate the fiber length.

[3M + 8M + 4M]

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

[8M + 7M]

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Set No. 2

Code No: R10103 / R10

I B.Tech I Semester Regular/Supplementary Examinations January 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) Two independent non-coherent sources of light cannot produce an interference pattern. Why?

(b) With ray diagram discuss the theory of thin films and derive the condition for constructive and destructive interference in the case of reflected system.

(c) A parallel beam of light ($\lambda = 5890\times10^{-10}$ m) is incident on a thin glass plate ($\mu = 1.5$) such that the angle of refraction into the plate is 60^{o}. Calculate the smallest thickness of plate which would appear dark by reflection.

[3M + 8M + 4M]

2.(a) What are the types of diffraction and give the differences between them.

(b) Obtain the condition for primary and secondary maxima in Fraunhofer diffraction due to single slit and derive an expression for width of the central maxima.

[6M + 9M]

3.(a) What are the quarter and half wave plates?

(b) Derive the expressions for thickness of quarter and half wave plates.

(c) Plane polarized light passes through a quartz plate with its axis parallel to the face. Calculate the thickness of the plate so that the emergent light may be plane polarized. For quartz $\mu_e = 1.553$, $\mu_o = 1.542$; $\lambda = 5.5\times10^{-5}$ cm.

[3M + 8M + 4M]

4.(a) Explain the unit cell and lattice parameters. What is primitive cell and how does it differ from unit cell.

(b) Describe the BCC crystal structure and obtain the expression for its packing factor.

(c) Iron has BCC structure below 910 ^{o}C and is FCC structure above 910 ^{o}C. The atomic radius of an atom is the same in both the cases. Calculate the ratio of the packing densities of bulk iron in the two structures at below 910 ^{o}C.

[4M + 7M + 4M]

5.(a) Sketch the (1 2 2) and (0 2) planes in a cubic unit cell.

(b) State and derive Bragg's law.

(c) How do distinguish between the simple cubic, BCC and FCC using powder X-ray diffraction data?

[4M + 5M + 6M]

6.(a) Describe the various methods of pumping lasers with suitable examples.

(b) Describe the construction and working of semiconductor laser.

[5M + 10M]

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Set No. 2

Code No: R10103 / R10

7.(a) Define acceptance angle and numerical aperture. Derive the expressions for for both of them.

(b) Calculate the number of modes propagating in an optical fiber of core of 6μm diameter, (given that the indices are 1.45 and 1.44 for core and cladding respectively) while operated at a wavelength of 0.623 μm.

[11M + 4M]

8.(a) Explain the basic principle of ultrasonic testing

(b) What are the advantages and limitations of ultrasonic testing.

[5M + 10M]

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Set No. 3

Code No: R10103 / R10

I B.Tech I Semester Regular/Supplementary Examinations January 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) What are Newton's rings? How are they formed? Why are they circular?

(b) Show that the radii of Newton's rings are in the ratio of the square roots of the natural numbers.

(c) In Newton's rings experiment, the diameters of the 4th and 12th dark rings are 0.40 cm and 0.70 cm respectively. Find the diameter of the 20^{th} dark ring.

[6M + 5M + 4M]

2.(a) What are the differences between interference and diffraction.

(b) Describe the Fraunhofer diffraction pattern obtained with single slit.

(c) A plane transmission grating having 4250 lines per cm is illuminated with sodium light normally. In second order spectrum the spectral lines are deviated by 30^{o} are observed. Find the wavelength of the spectral line.

[4M + 7M + 4M]

3.(a) Explain Brewster's law.

(b) Describe the construction and action of nicol prism.

(c) Find the polarizing angle for a glass of refractive index 1.732.

[4M + 7M + 4M]

4.(a) Explain the unit cell and lattice parameters. What is primitive cell and how does it differ from unit cell.

(b) Describe the BCC crystal structure and obtain the expression for its packing factor.

(c) Iron has BCC structure below 910 ^{o}C and is FCC structure above 910 ^{o}C. The atomic radius of an atom is the same in both the cases. Calculate the ratio of the packing densities of bulk iron in the two structures at below 910 ^{o}C.

[4M + 7M + 4M]

5.(a) Define Miller indies for designating i) direction, ii) plane, iii) family of directions and iv) family of planes.

(b) Sketch the (1 0 2) and (0 1) planes in a cubic unit cell.

(c) Derive an expression for inter planar distance between parallel planes (h k l).

[4M + 4M + 7M]

6.(a) Describe the

(i) spontaneous emission, (ii) stimulated emission,
(iii) absorption and (iv) population inversion.

(b) Obtain the relation between Einstein's coefficients.

[8M + 7M]

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Set No. 3

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(c) The optical power launched into an optical fiber is 1.5 mW. The fiber has attenuation of 0.5 db/km. If the power output is 2 μm, calculate the fiber length.

[3M + 8M + 4M]

8.(a) Discuss various non-destructive testing systems which are commonly adopted in industries using ultrasonics.
(b) Describe the ultrasonic flaw detector with suitable diagram.

[10M + 5M]

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Set No. 4

Code No: R10103 / R10

I B.Tech I Semester Regular/Supplementary Examinations January 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) Explain why the centre of Newton's rings is dark in the reflected system.
(b) Describe how you would use Newton's rings to determine the wavelength of a monochromatic radiation and derive the relevant formula.
(c) In Neton's rings experiment, the diameter of the 10^{th} ring changes from 1.40 cm to 1.27 cm when a liquid is introduced between the lens and the plate. Calculate the refractive index of the liquid.

[3M + 8M + 4M]

2.(a) What are the types of diffraction and give the differences between them.
(b) Obtain the condition for primary and secondary maxima in Fraunhofer diffraction due to single slit and derive an expression for width of the central maxima.

[6M + 9M]

3.(a) Explain Brewster's law.
(b) Describe the construction and action of nicol prism.
(c) Find the polarizing angle for a glass of refractive index 1.732.

[4M + 7M + 4M] 4.(a) Define crystal lattice, unit cell, lattice parameter and coordination number.
(b) Describe the FCC crystal structure and obtain the expression for its packing factor.
(c) Iron has BCC structure below 910 ^{o}C and is FCC structure above 910 ^{o}C. The atomic radius of an atom is the same in both the cases. Calculate the ratio of the packing densities of bulk iron in the two structures at below 910 ^{o}C.

[4M + 7M + 4M]

5.(a) Sketch the (1 2 2) and (0 2) planes in a cubic unit cell.
(b) State and derive Bragg's law.
(c) How do distinguish between the simple cubic, BCC and FCC using powder X-ray diffraction data?

[4M + 5M + 6M]

6.(a) Describe the
(i) spontaneous emission, (ii) stimulated emission,
(iii) absorption and (iv) population inversion.
(b) Obtain the relation between Einstein's coefficients.

[8M + 7M]

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Set No. 4

7.(a) Define acceptance angle and numerical aperture. Derive the expressions for for both of them.

(b) Calculate the number of modes propagating in an optical fiber of core of 6μm diameter, (given that the indices are 1.45 and 1.44 for core and cladding respectively) while operated at a wavelength of 0.623 μm.

[11M + 4M]

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

(b) Explain various applications of ultrasonic testing.

[8M + 7M]

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