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

I B.Tech I Semester Supplementary Examinations Nov./Dec. - 2015

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) Derive an expression for the wavelength of the light used in Newton's rings experiment in terms of the diameters of m^{th} & n^{th} dark rings.
   (b) In Newton's rings experiment the diameter of the 10^{th} dark ring changes from 1.40cm to 1.27cm when a liquid is introduced between the lens and the glass plate. Calculate the refractive index of the liquid.

[10+5]

2. (a) State Rayleigh criterion of resolution and obtain an expression for the resolving power of a grating.
   (b) Differentiate between Interference and Diffraction.

[10+5]

3. (a) With the help of neat diagrams explain how Nicol's prism is used to produce and analyze plane polarized light.
   (b) Derive the expressions for thickness of quarter and half wave plate.

[10+5]

4. (a) Obtain an expression for the packing factor of FCC structure.
   (b) Obtain the relations between the edge of the unit cell and atomic radius for the BCC and FCC lattices.

[10+5]

5. (a) What are miller indices? Draw the following planes in a cubic unit cell: (110), (311), and (011).
   (b) State and explain Bragg's law.

[10+5]

6. (a) Describe the construction and working of Ruby laser with relevant energy level diagram.
   (b) Explain various characteristics of a LASER light.

[10+5]

7. (a) Define acceptance angle of an optical fibre and derive an expression for it in terms of refractive indices of the core and cladding.
   (b) Calculate the angle of acceptance of a given optical fibre, if the refractive indices of the core and the cladding are 1.563 and 1.498 respectively.

[10+5]

8. (a) What is non-destructive testing? Explain with principle how flaw in a solid can be detected by non-destructive method using ultrasonics.
   (b) Describe in detail pulse-echo testing technique.

[10+5]

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

I B.Tech I Semester Supplementary Examinations Nov./Dec. - 2015

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) Derive the expression for fringe width in the case of Young's double slit experiment. Prove that the interference dark and bright fringes are of equal width.
   (b) Light of wavelength 500nm forms interference pattern on a screen at a distance of 2m from the slit. If 100 fringes are formed within a distance of 5cm on the screen, find the distance between the slits.

[10+5]

2. (a) Analyze qualitatively the spectrum obtained on exposing a diffraction grating to monochromatic light.
   (b) A plane grating having 10520 lines / cm is illuminated with light of wavelength 5×10^{-5} cm at normal incidence. How many orders are visible in the grating spectra?

[10+5]

3. (a) Explain the phenomenon of double refraction in detail.
   (b) Discuss various types of polarized lights.
   (c) A quarter wave plate is fabricated for a wavelength of 7600nm. For what wavelength does it work as a half wave plate?

[5+5+5]

4. (a) Describe the seven systems of crystals with suitable diagrams.
   (b) Copper has FCC structure and its atomic radius is 0.1278nm. Calculate interplanar spacing for (111) and (321) planes.

[10+5]

5. (a) Describe Laue's method for determination of crystal structure.
   (b) State and explain Bragg's law. What is the limiting condition for Bragg's law?

[10+5]

6. (a) Derive the relationship between Einstein's coefficients and explain their physical significance.
   (b) Discuss any five applications of LASER.

[10+5]

7. (a) What is the principle behind the functioning of an optical fibre? What are the advantages of the optical fibre over coaxial cables?
   (b) Discuss any four applications of an optical fibre
   (c) Using a step index fibre with n_1=1.48 and n_2=1.46 and the core radius 30μm, calculate the number of total internal reflections that will occur on its propagation in a length of 1 km fibre.

[5+5+5]

8. (a) What is the principle of ultrasonic testing and discuss the use of ultrasonics for non-destructive testing.
   (b) What are the benefits in nondestructive testing of products. [10+5]

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Subject Code: R10103/R10 **Set No - 3**

I B.Tech I Semester Supplementary Examinations Nov./Dec. - 2015

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) Derive the condition for maxima and minima for reflected light in case of thin transparent parallel film.
   (b) White light is incident on a transparent film of refractive index 1.33 and thickness 1.6μm at an angle of 45^0. When the reflected light is examined, a dark band corresponding to 500nm is seen. Find the order of the band.

[10+5]

2. (a) Analyze qualitatively Fraunhofer diffraction at double slit with suitable diagrams.
   (b) A grating has 6000 lines/cm. Find the angular separation between two wavelengths of 500nm and 510nm in the 3^{rd} order.

[10+5]

3. (a) How can Nicol's prism be used as polarizer and analyzer? Explain in detail with the help of diagram.
   (b) Discuss in detail the phenomenon of double refraction.

[10+5]

4. (a) Explain the terms (i) Basis and (ii) Space lattice
   (b) Describe the FCC crystal structure.
   (c) Define coordination number and packing factor of a crystal.

[5+5+5]

5. (a) Describe the powder method for determination of crystal structure with suitable diagrams.
   (b) A beam of X-rays of wavelength 0.071 nm is diffracted by (110) plane of rock salt with lattice constant of 0.28nm. Find the glancing angle for the second order diffraction.

[10+5]

6. (a) Describe the construction and working of He-Ne laser with relevant energy level diagram. List out its advantages over a ruby laser.
   (b) Differentiate between spontaneous and stimulated emissions of radiation.

[10+5]

7. (a) Draw the block diagram of an optical fibre communication system and explain functions of each block.
   (b) Find the numerical aperture and acceptance angle of a fibre with core of index1.4 and fractional refractive index change of 0.02.

[10+5]

8. (a) Discuss in detail the ultrasonic flaw detection.
   (b) What are the advantages and limitation of ultrasonic testing?

[10+5]

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

I B.Tech I Semester Supplementary Examinations Nov./Dec. - 2015

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) Draw experimental set up to obtain Newton's rings. Explain how interference takes place.
   (b) In Newton's rings experiment, diameter of 10^{th} dark ring for light of wavelength 600nm in air is 0.5cm. Find the radius of curvature of the lens.

   [10+5]
2. (a) Discuss the Fraunhoffer diffraction at a single slit. Obtain the conditions for principal maximum and secondary maxima & minima.
   (b) The sodium yellow doublet has wavelengths 589nm and 589.6nm. What should be the resolving power of a grating to resolve these lines?

   [10+5]
3. (a) What are polarized and unpolarized lights?
   (b) Discus atleast three methods of producing plane polarized light from unpolarized light.
   (c) Calculate the velocities of ordinary and extraordinary rays in calcite in a plane perpendicular to the optic axis. Given $\mu_O = 1.658$ and $\mu_E = 1.486$.

   [5+5+5]
4. (a) Explain the terms (i) Basis (ii) Space lattice and (iii) Unit cell.
   (b) Describe the BCC crystal structure.
   (c) Copper has FCC structure and its atomic radius is 0.1278nm. Calculate interplanar spacing for (111) and (321) planes.

   [5+5+5]
5. (a) What are Miller indices? How are they obtained?
   (b) Why x-ray's can be used to study the crystal structure? Explain.
   (c) X-rays of wavelength 0.12nm are found to undergo second order reflection at a Bragg angle of 28^0 from a lithium fluoride crystal. What is the inter-planar spacing of reflecting planes in the crystal?

   [5+5+5]
6. (a) What are semiconductor diode lasers? Describe with energy band diagram the construction and working of semiconductor diode laser.
   (b) What is population inversion and how can it be achieved?

   [10+5]
7. (a) What is attenuation in an optical fiber communication? Explain the attenuation mechanisms.
   (b) An optical fibre has a core of refractive index1.52 and fractional refractive index change of 0.0005. The fibre is placed in water of refractive index 1.33. Calculate (i) Numerical Aperture (ii) cladding refractive index (iii) critical angle and (iv) acceptance angle.

   [10+5]
8. (a) What is Magnetostriction effect? Explain.
   (b) Describe the production of ultrasonics by magnetostriction effect with a neat circuit diagram.

   [10+5]