Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 37006

B.E./B.Tech. DEGREE EXAMINATION, JANUARY 2014.

First Semester

Civil Engineering

PH 6151 — ENGINEERING PHYSICS — I

(Common to all branches)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a primitive cell? Give an example.

2. Name few techniques of crystal growth from melt.

3. A copper wire of 3 m length and 1 mm diameter is subjected to a tension of 5N. Calculate the elongation produced in the wire if the Young's modulas of copper is 120 GPa.

4. State Newton's law of cooling.

5. Find the lowest energy of electron confined to move in a one dimensional box of length 1Å. Given.

   $m_e = 9.1 \times 10^{-31}$ kg

   $\lambda = 6.625 \times 10^{-34}$ JS.

6. Write the principle of transmission electron microscope.

7. State Weber-Fechner law.

8. Are ultrasonic waves electromagnetic waves in nature? Explain.

9. Can a two level system be used for the production of laser? Why?

10. Write any four major advantages of optical fibre communication over other communication systems.

PART B — (5 × 16 = 80 marks)

11. (a) (i) What is packing factor? Prove that the packing factor of HCP is 0.74. (2 + 10)

(ii) Copper has fcc structure and its atomic radius is 1.273Å. Find

(1) Lattice parameter and (2)

(2) Density of copper. (2)

Given

Atomic weight of copper = 63.5

Avagadro's number = 6.026×10^{26} mol^{-1}.

Or

(b) (i) Describe Bridgmann method of crystal growth. (8)

(ii) Briefly explain the Chemical Vapour Deposition (CVD) method. (8)

12. (a) (i) Derive an expression for depression at the free end of cantilever due to load. (12)

(ii) Give an account of I-shape Girders. (4)

Or

(b) Describe with theory Lee's disc method of determination of thermal conductivity of a bad conductor. (16)

13. (a) (i) Derive Planck's law of radiation. (12)

(ii) In a Compton scattering experiment the incident photons have a wavelength of 3Å. What is the wavelength of the scattered photons if they are viewed at an angle of 60° to the direction of incidence? (4)

Given :

$M_e = 9.1 \times 10^{-3}$ Kg

$\lambda = 6.625 \times 10^{-34}$ Js

$C = 3 \times 10^8$ ms^{-1}.

Or

(b) Write the principle, working, advantages and disadvantages of scanning electron microscope. (16)

14. (a) State and explain Sabine's formula for reverberation time of a hall. Derive Sabine's formula for reverberation time. (16)

Or

(b) (i) Explain Piezo-electric effect. Describe the piezo-electric method of producing ultrasonic waves. (2 + 10)

(ii) Calculate the velocity of ultrasonic waves in a liquid in an acoustic grating experiment using the following data. (4)

Wavelength of light used = 600nm

Frequency of ultrasonic waves = 100MHz

Angle of diffraction = 5°

15. (a) (i) Describe the construction and working of Co_2 laser and their uses. (14)

(ii) For a semiconductor laser, the bandgap is $0.9eV$. What is the wavelength of light emitted from it. Use the following data: (2)

$C = 3 \times 10^8 m/s$

$\lambda = 6.625 \times 10^{-34} Js$

Or

(b) Explain the construction and working of displacement and Temperature fibre optic sensors. (8+8)

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Question Paper Code : 57698

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

First Semester

Civil Engineering

PH 6151 – ENGINEERING PHYSICS – I

(Common to all Branches)

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Write down the relation between atomic radius and lattice parameter of HCP.
2. Why is diamond called as loosely packed system ?
3. What is bending beam moment ?
4. Define coefficient of thermal conductivity.
5. Calculate the de Broglie wavelength associated with an electron having energy of 100 keV.
6. In an infinite square well potential, the energy eigen values are quantized. Why ?
7. Suppose a single violin produced 60 dB of sound intensity level, calculate the effective sound intensity level of 8 such violins.
8. What are the properties of ultrasonic waves ?
9. What do you mean by population inversion ?
10. Distinguish between step index and graded index fibers.

PART – B (5 × 16 = 80 Marks)

11. (a) Define the terms Atomic radius and Packing factor.
Calculate the above for SC, BCC and FCC structures.

OR

(b) Describe Bridgmann and Czochralski methods of crystal growth and compare their salient features.

12. (a) Derive the expression for the Young's modulus of an uniform bending of a rod and describe the experiment to determine the Young's modulus of that rod using this method.

OR

(b) Derive a differential equation (second order) to describe the heat conduction along a uniform bar. Hence, obtain the steady state solution of it.

13. (a) Explain Compton effect. Derive an expression for Compton shift of wavelength. Describe Compton experiment.

OR

(b) What is the principle of transmission electron microscope ? Draw the construction of transmission electron microscope and explain its working. Give its advantages, disadvantages and applications.

14. (a) Obtain Sabine's expression for reverberation in a hall.

OR

(b) (i) Explain with neat diagram, principle, construction, working of magnetosriction method to produce ultrasonics. **(12)**

(ii) Explain the uses of ultrasonics in non-destructive test. **(4)**

15. (a) Describe the construction and working of CO_2 laser with neat diagram and write down its applications. **(16)**

OR

(b) (i) Obtain the expression for numerical aperture of an optical fiber. **(10)**

(ii) Explain the importances of fiber optic communications. **(6)**

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Question Paper Code : 72383

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

First Semester

Civil Engineering

PH 6151 — ENGINEERING PHYSICS — I

(Common to all branches)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a unit cell?
2. Lattice constant of a BCC crystal is 0.36 nm. Find its atomic radius.
3. What are the types of Moduli of elasticity?
4. Define thermal conduction.
5. State Compton effect.
6. What is the basic principle in transmission electron microscope?
7. Define reverberation time.
8. What is SONAR?
9. What is an optical fiber?
10. What are the applications of Nd-YAG laser?

PART B — (5 × 16 = 80 marks)

11. (a) What are Miller indices? Derive an expression for the interplanar spacing (hkl) planes of a cubic structure.

Or

(b) Explain the following structures :

(i) Diamond (10)

(ii) Graphite (6)

12. (a) Derive an expression for the elevation at the centre of a beam which is loaded at both ends. Describe an experiment, to determine the Young's modulus of a beam loaded at both ends in detail.

Or

(b) Describe with relevant theory the method of determining the co-efficient of thermal conductivity of a bad conductor by Lee's disc method.

13. (a) Explain G.P. Thomson experiment to prove the wave nature of an electron.

Or

(b) What is the principle of an electron microscopy? Draw the construction of an electron microscope and explain its working. Compare it with optical microscope.

14. (a) What are the factors affect the acoustics of a building? Explain each factor along with its remedy

Or

(b) (i) What is acoustic grating? Describe the method of determining the velocity of ultrasonic waves using acoustic grating (12)

(ii) Mention any four applications of ultrasonic waves. (4)

15. (a) Explain how laser action is achieved in homojunction and heterojunction Ga-As laser with suitable diagrams.

Or

(b) Write short notes on :

(i) Endoscope (8)

(ii) Fibre optic - displacement sensor. (8)

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Question Paper Code : 77274

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

First Semester

Civil Engineering

PH 6151 — ENGINEERING PHYSICS — I

(Common to all Branches)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Planck's constant = 6.62×10^{-34} J s

Speed of light = 3×10^{8} m s^{-1}

Electron rest mass = 9.11×10^{-31} kg

Proton rest mass = 1.67×10^{-27} kg

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Calculate the d-spacing of (321) planes of a simple cubic cell of lattice constant 0.41 nm.

2. What is the coordination number of diamond unit cell?

3. How does change in temperature affect the elastic property of a material?

4. State Newton's law of cooling.

5. What is Compton effect?

6. Given that the wavefunction of a particle in a one dimensional box is given by $\psi = \sqrt{(2k)}e^{-kx}$, evaluate the probability of finding the particle in the region $\frac{2}{k} < x < \frac{3}{k}$.

7. A source of sound produces an intensity level of 1 dB at a given point. Calculate the intensity of sound.

8. What is the principle of A-scan display in ultrasonics?

9. What is the purpose of using helium in CO_2 laser?

10. Draw the block diagram of a fibre optical communication system.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive an expression for packing fraction of a BCC unit cell. (8)

(ii) Explain the Bridgman technique of growing crystal from melt. (8)

Or

(b) (i) Obtain an expression for d-spacing of (hkl) planes of a simple cubic lattice. (6)

(ii) Derive an expression for packing fraction of a hexagonally close packed structure. (10)

12. (a) (i) A cantilever is clamped horizontally at one end and loaded at the other. Obtain the relation between the depression at the loaded end and the load applied. (12)

(ii) Explain I-shaped girders. (4)

Or

(b) (i) Discuss the radial flow of heat and hence derive an expression for the quantity of heat conducted through any section in unit time. Describe the experiment to determine the thermal conductivity of Rubber. (12)

(ii) Two metal bars A and B are of 50 cm and 70 cm long respectively and have thermal conductivities 385 $Wm^{-1}k^{-1}$ and 296 $Wm^{-1}k^{-1}$ respectively. They are joined together by welding. The outer end of A is at 363 K and the cuter end of B is at 303 K. Calculate the temperature at the welded joint assuming that their cross sections are equal. (4)

13. (a) (i) What are matter waves? Describe the properties of matter waves. Explain in detail G.P. Thomson's gold foil experiment that proved the existence of matter waves. (6 + 6)

(ii) Calculate the de-Broglie wavelength of a proton and an electron, accelerated by a potential of 150 V. (4)

Or

(b) (i) Derive an expression for the energy of a particle in a one dimensional box. Also arrive at an expression for its normalized wavefunction (12)

(ii) A particle of mass one microgram takes 100 s to travel from one end to the other end of an one dimensional box of width 1 mm. Assume that the potential inside and at the walls of the box to be zero and infinity respectively. Determine the quantum number described by this motion. (4)

14. (a) Derive the expressions for rate of growth and rate of decay of average energy of sound in a hall. Hence derive an expression for reverberation time of the hall assuming that the average energy absorbed by all surfaces in one second to be equal to $\frac{EvA}{4}$ where E, v and A represent average energy density, speed of sound and total absorption by all surfaces respectively. (16)

Or

(b) (i) With a neat circuit diagram, explain the principle, working and production of ultrasonics by a piezo electric oscillator (12)

(ii) Explain briefly the through transmission method of non-destructively testing a specimen using ultrasonics. (4)

15. (a) Describe with necessary energy level diagram, the construction and working of Nd-YAG laser. Mention any two applications of Nd-VAG laser. (12 + 4)

Or

(b) (i) Derive expressions for numerical aperture and acceptance angle of an optical fibre. (12)

(ii) Discuss the classification of optical fibre based on the materials. (4)

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Question Paper Code : 80839

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

First Semester

Civil Engineering

PH 6151 — ENGINEERING PHYSICS – I

(Common to all branches)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. An element has FCC structure with atomic radius 0.144 nm. Find its lattice constant.

2. Define atomic packing factor.

3. How will you identify a brittle material from the stress-strain diagram?

4. Define thermal conductivity.

5. An electron is confined to a one-dimensional box. How does the energy level spacing changes when the box is made longer?

6. Give any four differences between scanning electron microscope and transmission electron microscope.

7. An auditorium has a plastered walls with sound absorption co-efficient of 0.10 O.W.U. The speech inside the auditorium is not clear due to too much of reverberation. It has been proposed to improve the acoustics of the hall. Two different materials with sound absorption co-efficient of 0.050 O.W.U. and 0.150 O.W.U. are available. Which material you will choose. Give reason.

8. Mention the techniques applied to determine the defects within a material through NDT.

9. Give some differences between the beam of light from a flash lamp and a laser.

10. A step index optical fibre has a core refractive index of 1.5 and cladding refractive index of 1.48. Calculate the critical angle at the core-cladding interface.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Deduce the relation between the interplanar distance '*d*' and the Miller indices (*h k l*) of the planes for a cubic system. (10)

(ii) Calculate the interplanar spacing for (110) and (111) planes in a simple cubic lattice whose lattice constant is 0.424 nm. Also sketch these planes. (6)

Or

(b) (i) Describe any one method of growing single crystal from melt along with the advantages and limitations of the method. (8)

(ii) Describe diamond and graphite structures. (8)

12. (a) (i) Derive an expression for internal bending moment of a beam. (8)

(ii) Derive an expression for the elevation produced at the centre of a simply supported beam loaded at both the ends. (8)

Or

(b) (i) Describe Lee's disc method to determine the thermal conductivity of bad conductors. (12)

(ii) A wall consists of layer of wood and a layer of cork insulation of same thickness. The temperature inside is 20°C and the temperature outside is 0°C. Calculate the temperature at the interface between wood and cork, if the cork is inside and the wood is outside also find the temperature at the interface if the wood is inside and the cork is outside. (Thermal conductivity of wood and cork are 0.13 W/m-K and 0.046 W/m-K respectively). (4)

13. (a) (i) Explain the radiation spectrum of a black body and derive Planck's radiation law. (12)

(ii) An X-ray photon of wavelength 0.010 *nm* is scattered through 110° by an electron. What is the kinetic energy of the recoiling electron? (4)

Or

(b) (i) Solve Schrodinger wave equation for a particle in a one-dimensional box. Sketch the wave function and probability distribution function of the particle when it is in the ground state and first two excited states. (12)

(ii) Find the de Broglie wavelength of an electron accelerated through a potential difference of 80 kV. Find the wavelength of a X-ray photon that possess an energy same as that of the electron. (4)

14. (a) Derive an expression for growth and decay of sound energy inside a hall and represent them graphically. Find an expression for Reverberation time. (16)

Or

(b) (i) Describe the construction and working principle of piezo-electric oscillator of producing ultrasonic waves. (10)

(ii) Briefly explain the principle of sonogram. (6)

15. (a) Explain Einstein's theory of stimulated emission and derive an expression for the ratio between spontaneous emission and stimulated emission. (16)

Or

(b) Explain the principle of propagation of light through an optical fibre and derive an expression for acceptance angle and numerical aperture. (16)

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