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

S 4058

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

First Semester

Civil Engineering

PH 1101 — PHYSICS — I

(Common to all branches)

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Calculate the percentage change of intensity represented by 1 decibel.

2. What is converse piezoelectric effect?

3. Define atomic packing factor.

4. Mention the seven crystal systems.

5. What is the action of a half wave plate on plane-polarised light passing through it?

6. In a Michelson's interferometer, 200 fringes cross the field of view when the movable mirror is displaced through 589×10^{-7} m. Calculate the wavelength of the monochromatic light used.

7. What is Compton wavelength?

8. Outline the physical significance of wave function.

9. Distinguish between step index and graded index fibres.

10. Determine the wavelength of the laser output from a GaAs p–n junction laser. Assume that $\Delta E = 1.4\, eV$ for GaAs. Planck's constant $h = 6.626 \times 10^{-34}$ Js. velocity of light $c = 3 \times 10^{8}\ ms^{-1}$.

PART B — ($5 \times 16 = 80$ marks)

11. (a) Discuss the factors which affect acoustics of buildings and the steps to be taken for realizing good acoustic characteristics. (16)

Or

(b) (i) Explain how the velocity of ultrasonic waves in a liquid can be determined using an acoustic grating. (10)

(ii) A quartz crystal of thickness 1 mm is set in resonant vibration. The fundamental frequency of vibration is 2.719 MHz. Estimate the Young's modulus of elasticity of quartz assuming that the density of quartz is 2650 kg m^{-3}. (6)

12. (a) (i) Calculate the atomic packing factor and coordination number for a BCC structure. (8)

(ii) What are Miller indices? Outline how Miller indices are determined for a set of equispaced and parallel crystallographic planes. (8)

Or

(b) Discuss the following NDT methods :

(i) ultrasonic flow detector. (8)

(ii) liquid penetrant method. (8)

13. (a) (i) Discuss the theory underlying the generation of elliptically polarised light and circularly polarised light using a quarter wave plate. (12)

(ii) Calculate the minimum thickness of a QWP plate made of quartz. Assume that $\lambda = 5893$ Å, $\mu_E = 1.5533$, $\mu_0 = 1.5442$. (4)

Or

(b) (i) Explain the theory of the air-wedge method of determining the thickness of a thin object. (12)

(ii) Two plates made of glass are in contact at one edge and are separated by a wire of 0.05 mm diameter at a distance of 15 cm from the edge of contact. Light of wavelength 6000 Å falls normally on the air film between the plates. Determine the fringe width. (4)

14. (a) Write down the Schroedinger's time-independent wave equation for a particle in a one-dimensional box. Solve the equation and determine the eigen values of energy and corresponding eigen functions. (16)

Or

(b) Explain Compton effect. Derive an expression for the change in wavelength in Compton scattering. (16)

15. (a) (i) Explain light propagation through multimode step index fibre. Obtain an expression for the numerical aperture in terms of the refractive indices of the core and cladding. (12)

(ii) Explain modal dispersion. (4)

Or

(b) (i) Explain stimulated emission of radiation. (4)

(ii) Discuss the working of He–Ne laser with appropriate energy level diagram. (12)
