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

Question Paper Code : 57034

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 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. A crystal plane cuts at 3a, 4b and 2c distances along the crystallographic axes. Find the Miller indices of the plane.

2. Define atomic packing fraction.

3. What is Poisson's ratio?

4. State Newton's law of cooling.

5. What is meant by degenerate state?

6. What is Compton wavelength? Give its value.

7. List four methods of detecting ultrasonic waves.

8. Calculate the intensity level of a turbine whose sound intensity is 100 Wm^{-2} when it is in operation. Given that the standard intensity level is 10^{-12} Wm^{-2}.

9. Define numerical aperture.

10. What are the roles played by the N_2 and He in CO_2 Laser?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the construction and working of Czochralski technique for growing crystals with its advantages. (12)

(ii) The lattice constant of a cubic crystal is 2.5 Å. Find the lattice spacing for (310) and (213) planes in the lattice. (4)

Or

(b) Show that in an ideal hexagonal closed packed structure the c/a ratio is 1.663 and its atomic packing factor equals to that of the face-centered cubic structure. (6 + 4 + 6)

12. (a) What is cantilever? Derive an expression for the depression at the free end of a cantilever when the other end is rigidly fixed (assume the weight of the cantilever is negligible). (16)

Or

(b) (i) Derive an expression for the rectilinear flow of heat along an uniform bar (One dimensional flow of heat). (13)

(ii) Calculate the thickness of the slap of area 90×10^{-4} m^2 through which 6 joules of heat is flowing per second through the opposite faces maintained at a temperature difference of 20 K. The coefficient of thermal conductivity of the material of the slab is 0.04 $Wm^{-1} K^{-1}$. (3)

13. (a) Derive an expression for Planck's radiation law and discuss the same for shorter and longer wavelengths. (16)

Or

(b) (i) Solve Schrödinger wave equation for a particle in a box (one dimensional) and obtain the energy eigen values. (10)

(ii) Describe the working of Scanning Electron Microscope. (6)

14. (a) (i) Describe in detail the production of ultrasonic waves by piezo-electric method. (10)

(ii) Draw a block diagram of ultrasonic flaw detector. Describe the working of ultrasonic flaw detector for non-destructive testing by reflection mode. (6)

Or

(b) Drive expressions for growth and decay of energy density inside a hall and hence deduce Sabine's formula for the reverberation time of the hall. (16)

15. (a) Explain the construction and working of CO_2 laser with its advantages. (16)

Or

(b) (i) Explain in detail how optical fibers are classified according to the material, refractive index and modes of propagation. (14)

(ii) What is the NA of a fiber, which has a relative refractive index difference of 0.05 and a core refractive index of 1.5? (2)
