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**Question Paper Code : 61092**

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

First Semester

Civil Engineering

PH 2111/PH 13/080040001 – ENGINEERING PHYSICS – I

(Common to All Branches)

(Regulations 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. A quartz crystal of thickness 0.001 m is vibrating at resonance. Calculate the fundamental frequency; Given  $Y$  for quartz =  $7.9 \times 10^{10}$  N/m<sup>2</sup> and  $\rho$  for quartz = 2650 Kg/m<sup>3</sup>
2. Loudspeaker cannot be used to produce ultrasonics. Justify.
3. Why laser welding is superior to conventional welding?
4. Calculate the number of photons emitted per second by a 7 mW laser, assuming that it emits light of wavelength 6325 Å.
5. A light of wavelength 6500 Å passes through a single mode optical fiber which has a maximum angle of acceptance as 13.28°. Calculate the diameter of the core.
6. Distinguish between meridional rays and skew rays.
7. State Heisenberg's uncertainty principle
8. Find the energy of the neutron in electron volts whose de Broglie wavelength is 2 Å
9. The lattice constant of a cubic lattice is 'a'. Calculate spacing between (011), (101), and (112) planes.
10. Distinguish between Frenkel and Schottky defect.

PART B — (5 × 16 = 80 marks).

11. (a) (i) What is piezoelectric effect? Explain in detail the principle, construction and working of a piezoelectric generator. (8)
- (ii) Discuss in detail the applications of ultrasonics in drilling, welding, soldering and cleaning. (8)

Or

- (b) (i) Explain in detail any three methods of detecting ultrasonic waves. (10)
- (ii) Briefly describe the technology involved in SONAR. (6)
12. (a) (i) Derive Einstein's A and B coefficients and comment on their physical significance. (8)
- (ii) With a neat sketch describe the working of a He-Ne Laser. (8)

Or

- (b) (i) Explain in detail the principle, construction and working of a semiconductor laser. (8)
- (ii) What is holography? Describe in detail the steps involved in recording a hologram. (8)
13. (a) (i) Deduce expression for propagation of light through optical fibers. (8)
- (ii) Discuss in detail the classification of optical fibres on the basis of materials, mode and refractive index profile. (8)

Or

- (b) (i) Briefly describe the principle and working of fiber optic temperature and displacement sensors. (8)
- (ii) With a neat block diagram explain the salient features of a fiber optic communication system. (8)
14. (a) (i) What is Compton effect? Describe the experiment and hence derive an expression for Compton's shift. (12)
- (ii) Calculate the de Broglie wavelength of an electron having a kinetic energy of 1000 eV. Compare the result with the wavelength of X-rays having the same energy. (4)

Or

- (b) (i) Derive Schrödinger's time independent equation and obtain the energy of a particle confined in a one dimensional potential well. (10)
- (ii) With a neat block diagram explain the construction and working of a TEM. (6)

15. (a) (i) Prove that the atomic packing factor for FCC and HCP are same. (8)
- (ii) Discuss in detail the diamond and NaCl crystal structures with suitable examples. (8)

Or

- (b) (i) Give a detailed account on the different types of crystal imperfections. (12)
- (ii) Write short notes on allotropy and polymorphism. (4)
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