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Question Paper Code: 31003

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

First Semester

Civil Engineering

01UPH103 - ENGINEERING PHYSICS

(Common to ALL Branches)

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Mention any two merits and demerits of Piezo electric oscillator.
2. Ultrasound cannot be produced by loudspeakers. Why?
3. The wavelength of light emitted by InP laser is $1.50 \mu\text{m}$. What is its band gap in eV?
4. Define optical pumping.
5. The refractive index of core and cladding are 1.60 and 1.50 respectively. Calculate the critical angle at core-cladding interface.
6. What is intermodal dispersion?
7. What is meant by degenerate and non-degenerate states?
8. Write the one dimensional Schrödinger time independent wave equation for a free particle.
9. Draw the planes which are having the Miller indices of (111) and (110).
10. The lattice constant for a unit cell of Aluminum is 4.049Å . Calculate spacing of the (210) plane.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Describe in detail the production of ultrasonic waves by Piezo-electric method. (12)

(ii) Describe different methods of detecting ultrasonic waves. (4)

Or

(b) Describe the method of determining the velocity of ultrasonic waves using acoustic grating. (16)

12. (a) (i) Describe the construction and working of CO₂ laser with necessary diagrams. (12)

(ii) A Nd-YAG laser emits light at wavelength of 1.063×10^{-6} m. If the output power is 20 W, then how many photons are emitted in ten minutes when the laser is in operation? Wavelength $\lambda = 1.063 \times 10^{-6}$ m. Output power P = 20 W. (4)

Or

(b) (i) Describe the method of construction and reconstruction of hologram. (12)

(ii) Mention any four medical applications of laser. (4)

13. (a) (i) Explain the double crucible technique of fibre drawing. (10)

(ii) A step index fiber has a core refractive index of 1.48. If the core diameter and the numerical aperture of the fiber are respectively 50 μ m and 0.5, find the refractive index of the cladding, the acceptance angle and maximum number of modes of light of wavelength 1 μ m the fiber can carry. (6)

Or

(b) Explain the working of fiber optic communication system with a neat block diagram. (16)

14. (a) (i) Derive an expression for Schrodinger time independent wave equation. (12)

(ii) State the physical significance of wave function. (4)

Or

(b) What is Compton effect? Derive an expression for the frequency of the scattered photon in terms of the frequency of incident radiation and scattering angle. (16)

15. (a) (i) An element has a HCP structure. If the radius of the atom is 1.605 \AA , find the volume of the unit cell. (2)

(ii) Prove that the packing factor for HCP structure is 0.74. (14)

Or

(b) Show that in ideal hexagonal closed packed structure c/a ratio is 1.663 and the density of atomic packing factor equals to that of the face-centered cubic structure. (16)

