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**Question Paper Code: 11003**

B.E./B.Tech. DEGREE EXAMINATION, DECEMBER 2013.

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 properties of ultrasonic sound waves.
2. What is SONAR? Give its principle.
3. Distinguish between spontaneous emission and stimulated emission.
4. Point out the role of Nitrogen and Helium in CO<sub>2</sub> laser.
5. State the condition to be satisfied for total internal reflection.
6. How can we minimize the radioactive losses in optical fibers?
7. Calculate the de-Broglie wavelength of an electron accelerated to a potential of 2KV.
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) What is inverse piezoelectric effect? Describe the construction and working of a piezoelectric generator to produce ultrasonic sound waves. (12)  
(ii) Longitudinal standing waves are setup in a Quartz plates with antinodes at opposite faces. The fundamental frequency of vibration is given by the relation  $f = (2.8 \times 10^3) / t$ , where f is in Hz and t is in meter. Calculate  
a) Young's modulus of Quartz plate.  
b) The thickness of the plate required for a frequency of 1300 KHz. The density of Quartz is 2660 kg/m<sup>3</sup>. (4)

Or

- (b) (i) With a neat diagram describe the pulse echo system. (12)
- (ii) Mention any four medical applications of ultrasonic sound waves. (4)
12. (a) (i) Describe the construction and working of Nd-YAG laser with neat energy level diagram. (12)
- (ii) Calculate the wavelength of radiation emitted by an LED made up of semiconducting material with band gap energy of 2.8eV. (4)

Or

- (b) (i) Explain how a hologram is constructed and reconstructed using coherent beam. (12)
- (ii) What are the differences between photography and holography? (4)
13. (a) (i) Explain how fibers are classified on the basis of materials and refractive index profile. (12)
- (ii) Mention any four advantages of optical fiber cables over copper cables. (4)

Or

- (b) (i) Derive the expression for numerical aperture and acceptance angle, also arrive the relation between fractional index changes with it. (12)
- (ii) Calculate the numerical aperture, acceptance angle for an optical fiber whose core and cladding has refractive indices are 1.59 and 1.40 respectively. (4)
14. (a) (i) What is Compton effect? (2)
- (ii) Derive an expression for the wavelength of a scattered photon from material; also explain how it is verified by experimentally? (14)

Or

- (b) (i) Calculate the minimum energy of an electron that can possess in an infinitely deep potential well of width 4nm. (2)
- (ii) Explain the construction and working of transmission electron microscope. Give its merits and demerits. (14)
15. (a) (i) An element has a HCP structure. If the radius of the atom is  $1.605\text{\AA}$ , find the volume of the unit cell. (2)
- (ii) Prove that the packing factor for HCP structure is 0.74. (14)

Or

- (b) (i) Explain in detail the crystal defects and their types. (14)
- (ii) Differentiate between single crystals and poly crystals. (2)