# Dr. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY LONERE - RAIGAD - 402103

# End Semester Examination – December – 2017

Branch: F.Y. B. Tech.

Semester: I

Subject: Engineering Physics (PHY103)

Marks: 60

Date: 15/12/2017

Time: 3 Hrs.

#### Instructions to the Students:

- 1. Each question carries 12 marks.
- 2. Attempt any five questions of the following.
- 3. Illustrate your answers with neat sketches, diagrams etc., wherever necessary.
- 4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

### Q1. Attempt the following:

a. Obtain the differential equation of wave motion.

**(6)** 

b. What is Piezoelectric and Magnetostriction Effect?

(4+2)

Calculate the natural frequency of 40 mm length of a pure iron rod. Given the density of pure iron is 7.25 X 10<sup>3</sup> kg/m<sup>3</sup> and its Young's Modulus is 115 X 10<sup>9</sup> N/m<sup>2</sup>. Can you use it in magnetostriction oscillator to produce ultrasonic waves?

## Q2. Attempt any TWO of the following:

- a. Derive an expression for the optical path difference for the reflected rays in a thin film of constant thickness and hence find the conditions for maxima and minima.
- b. What is double refraction? Explain the difference between ordinary ray (O-ray).and extra ordinary ray (e-ray).
- c. What is population inversion and stimulated emission? (4+2)

  Calculate the acceptance angle of an optical fibre where the refractive index of core is 1.55 and that of cladding is 1.50.

#### Q3. Attempt the following:

- a. With neat diagram explain principle and working of Bainbridge Mass Spectrograph. (6)
- b. Derive the time independent Schrodinger's wave equation. (6)

#### Q4. Attempt the following:

a. Define atomic radius. Calculate atomic radii in SC, BCC and FCC lattices with suitable (4+2) diagrams.

Lead exhibits FCC structure. Each side of unit cell is of 4.95 A<sup>o</sup> Calculate radius of lead atom.

**a.** Derive the relation between interplaner spacing 'd ' defined by Miller Indices (hkl) and (4+2) lattice parameter 'a '.

Calculate the interplaner spacing for (220) plane where the lattice constant is 4.938 A<sup>o</sup>.

**b.** What is X-ray? How do we get the continuous spectrum in X-rays explain. (4+2) An X-ray is operated at 20 kv. Calculate the minimum wavelength of X-rays emitting from it.

## Q5. Attempt the following:

- **a.** On the basis of domain theory explain B-H curve and hence explain retentivity and coercivity. (6)
- b. What is Superconductivity? Explain Meissner Effect in Superconductors. (2+4)

## Q6. Attempt the following:

- a. What is Hall effect? Derive an expression for Hall Coefficient.
- **b.** Derive an expression for electromagnetic wave in free space and hence calculate the value of velocity of light in free space.

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