

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE –
RAIGAD -402 103**

Winter Supplementary Examination – December - 2019

Branch: B. Tech

Semester: IV

Subject with Subject Code- Physics of Engineering Materials - (BTBSE406A)

Marks: 60

Date - 04/12/2019

Time - 3Hr.

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, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

Que. 1 Attempt the following.

- a) What is Schottky defect ? For Schottky defect prove that

8 Marks

$$n = N \exp\left(-\frac{E_s}{2kT}\right)$$

- b) Calculate the wavelength of X- ray beam incident at a glancing angle 12° for the first order reflection from a calcite crystal if the inter-atomic spacing d for the crystal is 3.035 \AA .

4 Marks

Que. 2 Attempt the following.

- a) For Langevin's Diamagnetic theory, prove that

8 Marks

$$\chi = -\frac{\mu_0 N e^2 R^2}{6m}$$

- b) A magnetic field of 1800 A/m produces a magnetic flux density of $3 \times 10^{-5} \text{ Wb}$ in an iron bar of cross sectional area 0.2 cm^2 . Calculate permeability.

4 Marks

Que. 3 Attempt the following.

- a) What is a Cooper pair? Explain BCS theory of superconductors.

8 Marks

OR

- a) What is Josephson effect? Write a note on Cryotron 8 Marks
- b) Calculate the critical current which can flow through a long thin superconducting wire of aluminium of 10^{-3} m diameter. The critical magnetic field for aluminium is 7.9×10^3 A/m. 4 Marks

Que. 4 Attempt the following.

- a) What is Hall effect? Derive an expression for Hall coefficient and mobility of charge carriers. Discuss any two of its applications. 8 Marks

OR

- a) Derive an expression for conductivity in intrinsic and extrinsic semiconductor materials. Write a note on Light Emitting Diode (LED). 8 Marks
- b) Calculate the conductivity of pure silicon at room temperature when the concentration of the carriers is $1.6 \times 10^{10} \text{ cm}^{-3}$. Given $\mu_e = 1500 \text{ cm}^2/\text{V-sec}$ and $\mu_h = 500 \text{ cm}^2/\text{V-sec}$. 4 Marks

Que. 5 Attempt the following.

- a) What is dielectric constant? Derive an expression for Clausius-Mosotti equation 6 Marks
- b) Explain temperature and frequency dependence of dielectric polarization 6 Marks

OR

Que. 5 Attempt the following.

- a) Explain powder method of X-ray diffraction. 6 Marks
- b) What is a Carbon Nano Tube (CNT)? Write properties and applications of CNTs. 6 Marks

*****Paper End*****