Total No. of printed pages = 4

3 (Sem 1) ELE M1

2015

ELECTRONICS

(Major)

Paper : 1.1

(Material Science)

Full Marks – 60

Time – Three hours

The figures in the margin indicate full marks for the questions.

1. Write 'Yes' or 'No' : 1×7=7

   (a) LED is a device based on electroluminescence.

   (b) An extrinsic semiconductor becomes more and more intrinsic as temperature increases.

   (c) Bandgap of metal is greater than that of insulator.

   (d) A pentode consists of two electrodes only.

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(e) In an optical fiber, core material is of lower refractive index compared to the cladding material.

(f) Band theory of solid is based on classical physics.

(g) Fermi factor is defined as the probability of occupancy of holes.

2. Answer the following questions : 2×4=8

(a) Name the seven basic crystal systems.

(b) Draw and explain the Zinc Blende structure of crystals.

(c) What do you mean by magnetic permeability ?

(d) What do you mean by doping in semiconductors ?

3. Answer any *three* of the following : 5×3=15

(a) Name four high resistivity materials and write on their applications.

(b) Explain why silicon is used for solar cells but not for LEDs.

(c) Describe an experiment for determining the Hall co-efficient.

(d) Write a short note on application of the triode.

(e) Write briefly on soft and hard magnetic materials. Draw their hysteresis loops also. 3+2=5

4. Answer any *three* of the following : 10×3=30

(a) On the basis of the classical free electron theory obtain Wiedemann – Franz law.

(b) What are the chief characteristics of ferroelectric materials ? Develop the dipole theory of ferroelectricity.

(c) Write briefly on the salient experimental features of superconductivity. Mention some of the important applications of super-conductivity. 5+5=10

(d) What do you mean by direct and indirect band gap semiconductors ? Give one example of each. Explain the processes of carrier generation and recombination with the help of energy band diagram. 3+2+5=10

(e) Calculate the position of the intrinsic Fermi level in silicon at 300K.

(f) What is meant by point defects in crystal lattice ? What are the different types of point defects ? 2+3+5=10