B Met Engg. Examination 2017

(3rd Year 2nd Semester)

Physics of Metal

Time: Three Hours   Full Marks: 100

Answer any five questions

1.a) State the postulates of quantum mechanics. Using the operator formalism find the time independent Schrödinger wave equation.   4+10

b) Find the momentum of free electrons satisfying the periodic boundary condition.   6

2.a) Find the solution for free particle in a rigid box. Explain that zero energy is excluded.   12+4

b) Using the above solution show that quantization arises due to confinement.   4

3.a) Find the average energy of free electrons in a ground state.   8

b) Define nearly free electrons. Draw and explain the E-K curve for the nearly free-electrons.   4+2+6

4.a) Derive an expression for electronic heat capacity of metals in the low temperature region.   15

b) Draw and explain the energy contour in the first zone.   5

5.a) Find the electronic concentration for the solubility limit of the binary f.c.c. α phase.   10

b) Electronic conductivity of Cu, Ag & Au is greater than divalent metals. Explain   10

6. a) Show that current carrying loop is equivalent to a magnetic dipole.   8

b) Show that the potential energy (w) of a magnetic dipole μ_m in a magnetic field is given by

$$w = - \mu_m.B$$

Where, **B** is magnetic flux density.   5

c) Explain the space quantization of spin and find the condition for the origin of magnetism.   5+2

7. Explain what is Bohr magneton? State the Curie law of paramagnetism. Explain the above Curie law with a suitable theory.   4+2+14

8.a) Define pole, trace of a plane, great circle and small circle.   2+2+2+2

b) Discuss the principle of drawing the stereographic projection of a tongitude.   8

c) Define crystal and explain the translational symmetry.   4