Seat No:_____ Enrollment No:_____

PARUL UNIVERSITY

FACULTY OF APPLIED SCIENCE

M.Sc./IMSc Winter 2019-20 Examination

Semester: 1/7 **Date: 06/12/2019**
Subject Code: 11204104 **Time: 10:30 a.m. to 1:00 p.m.**
Subject Name: Solid State Physics & Electronics-I **Total Marks: 60**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1. A) Essay type/ Brief note (4x2) (Each of 04 marks) **(08)**
(a) Write a short note on Kronig-Penny model.
(b) Discuss wave equation of an electron in a periodic potential.

Q.1. B) Answer the following questions (Any two)
(a) Give the answer of the following questions (Each of 02 marks) **(04)**
1. Schematically represent insulator, metal, semi-metal and semiconductor on the basis of electron occupancy of allowed energy bands.
2. Give in short the classification of materials on the basis of band theory of solids.
(b) Write a short note on empty lattice approximation. **(04)**
(c) Explain proof of Bloch theorem. **(04)**

Q.2. A) Answer the following questions.
(a) Short note. (Each of 02 marks) **(04)**
1. State various methods for the determination of Fermi surfaces.
2. Define Fermi energy and first Brillouin zone.
(b) Explain in short the tight binding method for studying electronic energy bands in solids. **(04)**

Q.2. B) Answer the following questions (Any two)
(a) Give the answer of the following questions (Each of 01 marks) **(03)**
1. What is Fermi surface?
2. State the unit of crystal momentum.
3. Orbits which enclose the filled states are known as _____.
(b) Write a short note on electron and hole orbits. **(03)**
(c) Explain in short the construction of Fermi surface in reduced zone scheme. **(03)**

Q.3. A) Essay type/ Brief note (4x2) (Each of 04 marks) **(08)**
(a) Giving neat circuit diagram, explain in short working of a class A push pull power amplifier.
(b) Write a short note Schmitt trigger circuit using transistor.

Q.3. B) Answer the following questions (Any two)
(a) Short note. (Each of 02 marks) **(04)**
1. Define multivibrator. What are the applications of bistable multivibrator?
2. Define the different classes of power amplifier.
(b) Draw circuit diagram of Astable multivibrator using transistor and explain working in short. **(04)**
(c) State important points of class A power amplifier. **(04)**

Q.4. A) Answer the following questions.
(a) Short note. (Each of 02 marks) **(04)**
1. Define Operational amplifier. Draw the circuit of current to voltage converter using op-amp.
2. Explain the terms inverting terminal and non-inverting terminal as applied to an op-amp.
(b) Describe applications of operational amplifier as integrator. **(04)**

Q.4. B) Answer the following questions (Any two)
(a) Give the answer of the following questions (Each of 01 marks) **(03)**
1. Define slew rate.
2. How virtual ground differs from actual ground?
3. Give anyone comparison between multivibrator and Schmitt trigger.
(b) Describe application of operational amplifier as voltage to current converter. **(03)**
(c) Explain in short the working of square wave generator using operational amplifier. **(03)**