Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

SIXTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION
JUNE 2019
SUBJECT: INTRODUCTION TO NANOSCIENCE AND TECHNOLOGY (ECE - 3290)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Explain how the FCC and HCP structures can be called as close packed structures.

1B. Calculate number of atoms in a 1.4 nm diamwter of Pt. Consider that Pt has FCC structure with the lattice parameter 0.391 Å.

1C. What is Hamiltonian? Write the law of conservation of energy in terms of Hamiltonian for a paricle moving in a potetial field which is independent of time.

(4+3+3)

2A. Derive the time independent Schrodinger equation and explain its importance.

2B. Explain an experiment that proves that the matter waves indeed exhibit the interference phenomenan.

2C. Describe the nature of the solutuion for a particle confined in a classically allowed region under an arbitrary potential well. How it differes with that in the classically forbidden region.

(4+3+3)

3A. Determine the energy density of a progressing plane wave and also the standing waves. Comment on the result.

3B. Indicate the energy and the wave functions of first four energy levels of a particle confined in a potential well having infinet potential walls.

3C. Define the phase velocity of a wave. Taking an example to define the eigen function and associated eigen value.

(4+3+3)

4A. Describe experimental techniques to grow the CNT by utilising the catalyst nanostructures.

4B. Write the chemical equations in preparation of electronic grade Si.

4C. Explan the photolithography process and explain its limitation. Indicate the ways and mean to circumvent this problem.

(4+3+3)

5A. Explain the principle of AFM and how it differs with that of STM. Explain with an example how STM can be utilised to manipulate the atoms on a surface.

5B. Explain the principes of the SEM and TEM. Explain how to prepare a sample for TEM study.

5C. Explain the experimental procedure for STM tips preparation.

(4+3+3)