*Total No. of Questions : 8]* *[Total No. of Printed Pages : 1*

**Roll No** .....

# MNT-201

## M.E./M.Tech., II Semester Examination, June 2020

## Properties of Nanostructure

***Time : Three Hours***

***Maximum Marks : 70***

***Note :*** i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) Explain the electrical transport phenomena in semiconductor nanostructured materials.
   b) Describe Quantum wells, Quantum wire and Quantum dots; What are the basic difference among these nanostructures?

2. a) Discuss the vibrational and thermal properties of low dimensional materials using suitable examples.
   b) What are 0D, 1D, 2D and 3D phonons compare their properties, how they affect the physical properties of materials at nano level?

3. a) What are the Nanofluids? Explain the thermal conductivity of nanofluids.
   b) How the physical properties of nanofluid changes with the size of nanoparticles. What are the applications of nanofluids are there in industry?

4. a) Describe the optical properties of nanomaterials. Explain the linear and non-linear optical properties of nanomaterials using two examples
   b) What is surface Plasmon resonance? How it is used to explain the optical properties of nanomaterials?

5. a) Explain the concept of Negative refractive index. How this type of negative refractive index can be explained in case of metamaterials?
   b) Write short notes on
      i) Plasmonic nanowire metamaterials
      ii) Super resolving metamaterials

6. a) Explain the use of meta materials in passive microwave devices and antenna transmission.
   b) Explain the phenomena of interaction between nanoparticles also describe the coupled-dipole approximation in nanoparticles.

7. a) Discuss optical blueshift phenomenon in nanomaterials. Also explain the effective mass approximation.
   b) How Reynold number changes in nanofluids? Explain optical tweezer.

8. a) Describe the phenomena of super conductivity in nanomaterials. Explain flux quantization in case of nanomaterials.
   b) What is Quantum Hall effect? Explain fractional Q Hall effect.

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