Registration No : | | | | | | | | | | |

Total Number of Pages : 01 **M.Tech**

P1PNBC04

1st Semester Regular/Back Examination 2019-20
INTRODUCTION TO NANOTECHNOLOGY
BRANCH : POLYMER NANOTECH.
Max Marks : 100
Time : 3 Hours
Q.CODE : HRB738

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Only Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) Define Zeroth law of thermodynamics with physical significance?
b) State the importance of reciprocal lattice.
c) If the lattice parameter of a BCC crystal is 4Aº, Find the radius of the particle.
d) How peptide bond occurs on polymers and explain it?
e) Differentiate copolymer and block-copolymer.
f) Write short notes on supramolecular switches?
g) List out the carbon materials?
h) Distinguish between molecules, nanoparticles and bulk according to the number of atoms in the clusters.
i) What does “magic-sized nanocluster” mean? Mention some doubly magic isotopes.
j) Derive the Joule-Thomson coefficient.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Describe in detail about the types of semiconductors with suitable example.
b) What is Bravices lattice and explain its classification.
c) Discuss about the recent advancement in nanotechnology.
d) Derive two T-ds equation
e) Derive clausiusclapeyron equation
f) What is a reversed Carnot heat engine? Explain it.
g) Classification of any two supramolecular structures? How it related to nanotechnology?
h) Differentiate MEMS and NEMS technology with applications, advantages and disadvantages.
i) Write short notes on luminescence and its classifications?
j) Explain briefly about photonic crystals.
k) Explain zeolites and the formation of lattice like structures of nanoparticles with the incorporation of zeolites.
l) Discuss briefly about carbon nanotubes and its applications.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** What is band theory of solid? Explain in detail about the types of bandgap. **(8)**
b) Write a note on the Fermi surface. **(8)**

Q4 What is Maxwell’s thermodynamic relation? Derive Maxwell’s thermodynamic relations. **(16)**

Q5 **a)** Briefly discuss about biological nanomaterials with neat diagram. **(8)**
b) Discuss and explain about MEMS technology. **(8)**

Q6 What are metal nanoclusters? Explain different synthesis methods with neat diagram. **(16)**