Exam.Code:1031
Sub. Code: 7862

2021
M. Tech. (Material Science and Technology)
Third Semester
MST-302: Nano-Materials

Time allowed: 3 Hours Max. Marks: 50

***NOTE**: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.*

x-x-x

I. Attempt any five of the following:-

a) List advantages of Molecular beam epitaxy.

b) Give three methods of reducing surface energy of a nanoparticle system.

c) List technically important properties of carbon nanotubes.

d) What do you understand by micelle and reverse micelle structures.

e) Draw Pressure-Area isotherms for Langmuir films fabricated on a liquid surface.

f) What is the cause of Ostwald ripening?

g) Why is silicon carbide a potential material for fabricating artificial heart valves? (5x2)

UNIT – I

II. a) How do you understand the mechanical properties of nanostructured materials?

b) Give a brief account of Sol-Gel technique for synthesis of nanomaterials. (2x5)

III. a) Give the physical mechanism of sputtering. What are different methods employed to sustain the plasma. How do you fabricate a thin film using this technique.
b) Discuss the step-wise process to fabricate Langmuir-Blodgett film and deposit it on the hydrophilic substrate. (2x5)

IV. a) Discuss two experimental methods to synthesis clusters of nanoparticles.
b) Give distinct features of Bottom-up and Top-down approaches of synthesis of nanomaterials. (6,4)

UNIT – II

V. What are nano-composites? Give two techniques to -synthesize nano-composite. Discuss how nano-composites can be used as bio-sensors. (10)

VI. Discuss the structure of C60 molecule and carbon nanotube. What are nanostructured carbon coatings? What are various applications of such coatings? (10)

VII. Write a note on any two of the following:-

a) Band gap engineered quantum devices.

b) Photonic crystals.

c) Biomedical imaging. (2x5)