Total No of Pages: 02 *Roll No. .....*

VIth Semester **B.Tech (EP)**

MID SEMESTER EXAMINATION **Mar-2019**

EP304 Fabrication and Characterization of Nanostructures

Time: 1:30 Hours ***Max. Marks: 25***

Note: Answer all questions. Assume suitable missing data, if any.

Q.1 **(a)** Classify nanomaterials based on their dimensions and explain the difference between top-down and bottom-up approaches for the synthesis of nanomaterials.

(b) What is quantum confinement effect? Show mathematically that surface to volume ratio of a nanoparticle is much higher than that of the bulk particle of the identical material. (2.5x2=5)

Q.2 Describe and illustrate the working principle of a tunnelling electron microscope (TEM) and explain its sample preparation method. (5)

Q. 3 Write short note on any two of the following

(a) Photolithography

(b) Self assembly and Self organization

(c) Bragg's Law (2.5x2=5)

Q.4 A cubic crystal was placed in an x-ray diffractometer using incoming x-rays with a wavelength $\lambda = 0.154$nm. The various peak intensities recorded at different 2θ values are given in following table.

2θ (deg)	40.3	58.3	73.2	154.2	131.2
(h k l)	(110)	(200)	(211)	(400)	(321)
Relative Intensity	100	15	23	2	18

P.T.O.

Determine the following

(a) Calculate the crystalline size (Given, $k = 0.9$; $\beta = 0.0098$)

(b) Calculate the value for the lattice constant (Assume first order diffraction with n=1) (2+3=5)

Q5. Discuss in detail about atomic force microscope (AFM) and operating modes in AFM. What are the advantages and disadvantages of AFM over STM ? (5)

END