



DAI-003-0491109

Seat No. _____

B. Sc. / M. Sc. (Sem-X) (CBCS) Examination

April - 2022

Applied Physics : Paper-16 (Elective-4)

(Nanostructuring with Ion Beams

(New Course)

Faculty Code : 003

Subject Code : 0491109

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

Instructions : (1) All questions are compulsory.
(2) Numbers in the right margin indicate marks.

1 Attempt any SEVEN short questions (Two marks each) 14

- (1) What is unit cell ?
- (2) What is primitive and non-primitive cell ?
- (3) Discuss plane of zone and zone axis.
- (4) What is adatom ?
- (5) Define surface binding energy and displacement energy of an atom in the target.
- (6) Define frenkle defect.
- (7) What is preferential sputtering ?
- (8) What is Ehrlich Schwoebel barrier ?
- (9) Define roughness of the surface and write its equation.
- (10) What is sputter yield ?

2 Write the answer of any two question : 14

- (1) Discuss different types of crystal systems.
- (2) What is symmetry ? Discuss different symmetry operations with examples ?
- (3) What is co-ordination number and discuss its dependency on atomic size ?
- (4) Discuss stereographic projection.

- 3** Write the answer of any two questions : **14**
- (1) What is ion range and straggling of energetic ions in a target?
 - (2) Discuss different defect formation during energetic ion bombardment on elemental target ?
 - (3) Discuss linear collision cascade for ion bombardment on elemental target.
 - (4) List the processes effecting composition changes during sputtering. Discuss any two process in details.
- 4** Write the answer of any **two** questions : **14**
- (1) Considering the yield, $Y_0(\phi)$, discuss the curvature dependent of sputtering.
 - (2) For slowly varying surface prove that the height of the surface is given by $h(x) = -x^2 / 2R$.
 - (3) Discuss ripple orientation and wavelength of the ripples formed during ion bombardment according to linear B-H model.
 - (4) Describe the advantages of ion-beam induced nano-patterning of materials and list the different parameters which influences the pattern formation.
- 5** Write the answer of any **two** questions : **14**
- (1) Discuss ion beam induced sputter deposition.
 - (2) List different applications of ion beam induced patterned surfaces and describe any two in detail.
 - (3) Discuss scaling concept and dynamic scaling ?
 - (4) Discuss an ion beam induced bandgap engineering of semiconducting materials and list their applications.
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