Seat No. _____

H-003-0491101

B. Sc./M. Sc. (Applied Physcis) (Sem. X) (CBCS) Examination

April - 2023

Ion Beams in Materials Science : Paper-13 (Core-10)

(New Course)

Faculty Code : 003

Subject Code : 0491101

Time : $2\frac{1}{2}$ / 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 do you mean buy Ostwald ripening ?

(2) Explain the term : RBS, ERDA and NRA.

(3) What do you mean by SIMS ?

(4) What is Fick's law of diffusion ?

(5) Define : ion range and distribution and ion channeling.

(6) What do you mean by effective charge of moving ion ?

(7) What is the sputter yield ? Write any two applications of sputtering ?

(8) Write down the advantages of ion implantation.

(9) Define kinematic factor for RBS.

(10) List the name of two synthesis methods for nanostructures based on ion beam.

2 Write the answer of any two questions : **14**

(1) Write a detailed note on Linhard Scharff model.

(2) Describe in detail : Firsov model.

(3) Describe Fermi - Teller model for electronic stopping of low energy ions.

(4) Define sputtering process. Write a short note on nuclear and electronic sputtering.

3 Write the answer of any two questions : **14**

(1) What is the importance of ion implantation in the creation of controlled defects ? Explain point defects, line defects, and columnar defects produced by energetic ion irradiation.

(2) Write a short note on the radiation enhanced diffusion process. State the difference between Schottky defect and Frenkel defects.

(3) Give a brief overview of what energetic ions can do while interacting with the material.

(4) What do you mean by ion implantation ? Explain with its applications in material science.

4 Write the answer of any two questions : **14**

(1) Explain about nano pattering of ripple formation.

(2) Discuss the formation of nanodots by ion beam technique.

(3) Explain the ion track formation in thin film with its limitations.

(4) What is ion beam mixing ? Discuss importance of the ion beam mixing for the synthesis of alloys.

5 Write the answer of any two questions : **14**

(1) Discuss the advantages and limitations of ERDA.

(2) What do you mean by RBS technique ? Explain the uses, strengths and limitations of RBS technique.

(3) Describe working principle of the NRA. Why NRA is used to measure the low Z-elements ? Write down the parameters which determine the (a) energy and (b) yield of the emitted particle in case of NRA ?

(4) What do you mean by SIMS ? Explain its working.
