45073 C

M.Sc. DEGREE EXAMINATION, MARCH/APRIL 2019.

Fourth Semester

Physics

Paper III — VACUUM AND THIN FILM PHYSICS

Time : Three hours

Maximum : 75 marks

(No additional sheet will be supplied)

PART A — (5 × 3 = 15 marks)

Answer any FIVE of the following.

Each question carries 3 marks.

Each answer should not exceed 1 page.

1. Write the working principle of a mechanical roots pump.

2. Explain the importance of vacuum in freeze drying.

3. Briefly explain the deposition of thin films by flash evaporation.

4. Describe the growth of metal oxide thin films by reactive evaporation.

5. Explain condensation and nucleation processes.

6. How do you measure the thickness of a thin film by multiple beam interferometer.

7. What are the sources of electrical resistivity in metallic thin films?

8. Write a note on optical filters.

PART B — (4 × 15 = 60 marks)

Answer ALL questions.

Each question carries 15 marks.

Each answer should not exceed 6 pages.

9. Describe the construction of a high vacuum coating unit with neat diagram. What are various pump combination and gauges used in the construction and explain their working principles.

Or

10. (a) With a neat diagram, explain the working principle of hot cathode ionization gauge.

(b) Write the working principle and advantage of Bayard Alpert gauge.

11. Describe r.f magnetron sputtering technique to prepare thin films and discuss the relative merits of this technique when compared to dc sputtering technique.

Or

12. (a) Describe the growth of semiconductor thin films by chemical vapour deposition technique.

(b) Explain the growth of thin films by pulsed laser deposition technique.

13. Discuss the condensation process and give a brief account of the Langmuir-Frenkel theory of condensation.

Or

14. (a) Describe how does the quartz crystal oscillator act as a film thickness monitor.

(b) Explain the four stages of film growth.

15. (a) What are reflection and anti-reflection coatings and explain their applications.

(b) Describe the determination of optical constants by ellipsometry.

Or

16. (a) Discuss the Fuchs – Sondhemier theory.

(b) Write a short note on thin film capacitors films.

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