BBK-003-0498001 Seat No. _____

B. Sc. / M. Sc. (Applied Physics) (Sem. VIII) (CBCS) Examination

July - 2021

Core - 5, Paper - V : Vacuum Technology & Thin Film (New Course)

Faculty Code : 003

Subject Code : 0498001

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instruction : Attempt any five questions.

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

1. Vacuum Definition. Describe vacuum as pressure. The relation between pressure units pascals, mbar, Torr.
2. What are typical limitations of rotary pumps?
3. What are the drawbacks of Diffusion pumps?
4. Define Nucleation rate.
5. What is the role of stirring and heating in electrodeposition?
6. Why PECVD can be operated at lower temperature than CVD?
7. Define homogeneous and heterogeneous nucleation

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

1. What are different gas sources in a vacuum chamber?
2. What is vacuum gauge?
3. Explain how the Residual Gas Analyser works.
4. What is the basic principle of working of a sputter ion Pumps?
5. Define thin film. Give the names of film deposition techniques.
6. Draw a schematic diagram and name the basic thin film deposition stages
7. Define sputtering yield and sputtering threshold.

3 Write answers of following questions 14

1. Explain the Diaphragm pump and its application.
2. Explain: Various types of Gas sources in the vacuum chamber to define total gas load (Q) like leak, Outgassing, Permeation, Virtual leak, Evaporation, Oil Backstreaming Operating pressure (gas Fueling pressure) etc.

4 Write answers of following questions 14

1. Describe principle and working of the Diffusion pump in detail.
2. Explain Gas laws: Boyle's Law, Gay-Lussac's law or Charles' Law, Dalton's Law.

5 Write answers of following questions 14

1. Prepare a diagram of the setup of a High vacuum pumping system (Turbo- molecular Pump + Rotary Pump + gauges + Chamber + Piping) and explain it.
2. Explain the Pirani gauge in details.

6 Write answers of following questions 14

1. Describe: Principle and Use of Helium Leak Detector.
2. Describe the Cold cathode Ionization gauge (Penning gauge) in detail.

7 Write answers of following questions 14

1. Explain Small cluster model for thin film nucleation.
2. Explain the role of various deposition parameters for epitaxial growth of thin film.

8 Write answers of following questions 14

1. Explain the classical Capillarity model for thin film nucleation.
2. Describe the processes involved in grain structure of polycrystalline film.

9 Write answers of following questions. 14

1. Explain pulsed laser deposition. What are advantages and disadvantages of this technique?
2. What are the advantages of e-beam evaporation over thermal evaporation? Explain self- accelerated e-beam evaporation technique.

10 Write answers of following questions. 14

1. Describe glow discharge and it's utility for RF sputtering thin film deposition.
2. What are the role of density and the mechanism of microbalance and quartz crystal techniques of thickness measurement?
