P-003-0498001 Seat No. _____

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

March / April – 2020

Paper - V : Vacuum Technology & Thin Film

(Core - 5) (New Course)

Faculty Code : 003

Subject Code : 0498001

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

1 Attempt any **seven** short questions : (**two** marks each) **14**

(1) Define Vacuum. Describe vacuum as pressure. Give the relation between pressure unit's Pascals, mbar and Torr.

(2) Explain Mean Free Path (λ).

(3) Classification of vacuum ranges. Describe these ranges with respect to mean free path (λ) and chamber diameter (D).

(4) How to avoid back-streaming of Oil in Diffusion Pump ?

(5) Why Helium is used as a tracer gas in leak Detector ?

(6) Define thin film. Give the names of film deposition techniques.

(7) Classify the source in thermal deposition technique. Draw the sketch of different sources.

(8) Explain the term sputtering. Give the name of different types of sputtering.

(9) Give the comparison between capillarity model and atomistic model of nucleation.

(10) Explain the variation in grain size with deposition parameter.

2 (A) Write answers of any **two** : **10**

(1) How to define the average speed of any gas at any temperature using Maxwell - Boltzmann kinetic gas theory ? Give an Example for any gas like H_2, N_2 etc.

(2) Describe types of gas flows in the vacuum system. How to define types of Gas flows in the vacuum system ?

(3) Describe the Diffusion pump in Details.

(4) Describe the pump down in Low Vacuum and High Vacuum.

(B) Write answers of any **one** : **4**

(1) Explain Gas laws : Boyle's Law, Gay-Lussac's law or Charles' Law, Dalton's Law.

(2) Describe the Sputter-Ion pump in detail.

3 Write answers of any **two** : **14**

(1) Explain the Pirani gauge in details.

(2) Describe the cold cathode ionization gauge (Penning gauge).

(3) Describe: Principle and use of helium leak detector.

(4) Explain Quadrupole Mass Spectrometer in detail.

4 Write answers of any **two** : **14**

(1) Write a detail note on glow discharge sputtering.

(2) Discuss chemical vapour deposition methods in detail.

(3) Write a note on Resistance heating.

(4) Discuss any one optical method for film thickness measurement in detail.

5 Write answers of any **two** : **14**

(1) Describe atomistic model with neat sketch models and equations.

(2) Explain thermodynamics of nucleation in details.

(3) Discuss the different stages of film growth.

(4) Write a note on :

(1) Epitaxial deposition and

(2) Twining and multitwining for structure of a thin film.
