Total No. of printed pages = 4

63/2 (SEM-2) PHY 206(OE)

2022

PHYSICS

(Theory Paper)

Paper Code : PHY 206(OE)

(Basics of Vacuum Science and Low Temperature Physics)

Full Marks – 50

Time – Two hours

The figures in the margin indicate full marks for the questions.

1. Answer the following questions : 1×5=5

   (a) Define vacuum.

   (b) What are the different units to measure pressure ?

   (c) In what kind of industries vacuum technology is important ?

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(d) What is rough vacuum ?

(e) What kind of gauges are effective to measure very high vacuum ?

2. Answer any *five* of the following questions : 2×5=10

(a) Explain why roughing and backing pump is required in addition to high vacuum pump in the construction of a vacuum system.

(b) Explain the general principle of hot cathode ionization gauge.

(c) Explain the general principle of cold cathode ionization gauge.

(d) Write a short note on low temperature physics.

(e) Write about the vacuum gauges which work on the basis of mechanical deformation of material.

(f) Why strong magnetic field is used in cold cathode vacuum gauge ?

(g) What is the basic principle of a turbo-molecular pump ?

3. Answer any *seven* of the following questions : 5×7=35

(a) Establish the relation among the throughput (gas flow rate) Q, volumetric flow rate S and pressure P.

(b) Explain the working principle of rotary pump with the help of a neat diagram.

(c) In which vacuum range hot cathode ionization gauges are used ? Explain the construction and working principle of hot cathode ionization gauge.

(d) Explain the working mechanism of cryogenic pump and write down the advantages and disadvantages of the pump.

(e) Explain the working principle of cold cathode ionization gauge. Show the construction with a diagram. Write the advantages and disadvantages of the gauge.

(f) Explain the working principle of diffusion pump with proper diagram. Why cooling is required in diffusioin pump ?

(g) Write the importance of refrigeration. Explain the thermoelectric refrigeration in details.

(h) Explain the working mechanism of McLeod vacuum gauge with proper diagram. Write the advantages and disadvantages of this gauge.

(i) Based on which thermodynamic principle the thermocouple vacuum gauge measure pressure in a vacuum chamber ? Describe in detail the working principle and construction of a thermocouple vacuum gauge. Write the advantages and disadvantages of the thermocouple gauge.