

**PARUL UNIVERSITY**  
**FACULTY OF APPLIED SCIENCE**  
**M.Sc. Summer 2022-23 Examination**

**Semester: 4****Subject Code: 11204254****Subject Name: Experimental and Characterization Techniques****Date: 22-03-2023****Time: 2:00pm to 4:30pm****Total Marks: 60****Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

- Q.1. A) Essay type/ Brief note (4x2) (Each of 04 marks) (08)**  
(a) What is the importance of vacuum pump? Write a short note on vacuum pump that used for backing.  
(b) Write a short note on vacuum gauge in detail.
- Q.1. B) Answer the following questions (Any two) (04)**  
(a) Short note. (Each of 02 marks) (04)  
1. List the different types of vacuum pumps.  
2. List the different types of gauges.  
(b) Write short notes on the Pirani and Pirani gauge. (04)  
(c) Write a short note on the thermocouple gauge. (04)
- Q.2. A) Answer the following questions. (04)**  
(a) Short note. (Each of 02 marks) (04)  
1. List the various synthesis methods for nanomaterials synthesis.  
2. Write down the principle of formation of thin film by E-beam evaporation.  
(b) Write short notes on PVD method. (04)
- Q.2. B) Answer the following questions (Any two) (03)**  
(a) Short note/ Multiple choice questions. (Each of 01 marks) (03)  
1. What is the full form of PLD?  
2. What do you mean by epitaxial growth for nanomaterials.  
3. What is dip coating?  
(b) Explain the CVD method. (03)  
(c) Write short note on the sol-gel method. (03)
- Q.3. A) Essay type/ Brief note (4x2) (Each of 04 marks) (08)**  
(a) Explain how can determine the structural analysis from XRD.  
(b) Short note on the compositional analysis using XPS.
- Q.3. B) Answer the following questions (Any two) (04)**  
(a) Short note. (Each of 02 marks) (04)  
1. Write down the name of techniques for compositional analysis.  
2. Why scattering angle used is  $2\theta$  in XRD?  
(b) Write short notes on the LEED. (04)  
(c) Write short notes on RBS measurements (04)
- Q.4. A) Answer the following questions. (04)**  
(a) Short note. (Each of 02 marks) (04)  
1. How can we identify the surface morphology of the thin film?  
2. How can we determine the optical band gap from the UV-Vis- NIR spectroscopy data?  
(b) Write short notes on the SEM (04)
- Q.4. B) Answer the following questions (Any two) (03)**  
(a) Short note/ Multiple choice questions. (Each of 01 marks) (03)  
1. Give the Full form of TEM.  
2. List any two surface techniques.  
3. List any two spectroscopic techniques.  
(b) Write short notes on the Raman spectroscopy. (03)  
(c) Write short notes on the Hall measurement. (03)