PRN:		Course Code :	PCH307

Second Year **M.Sc.** Semester End Examination Summer 2024

Surface Analytical Techniques

Day and Date: 27 MAY 2024 , Mon Max Marks: **100**

Time : 10:30AM To 01:30PM Duration: **03** hrs

Instructions:

1. All questions are compulsory.
2. Use of log table and scientific calculator is allowed.

		Marks	Bloom's Level	CLO
Q.1	**Attempt the following**			
a)	Write the principles and draw the schematic diagram of instrumentation of scanning electron microscopy (SEM).	08	L2	CLO 1
b)	What is HRTEM? Explain Working Principle of HRTEM. Give applications of HRTEM.	08	L2	CLO 1
c)	Explain Principle of TEM and Describe instrumentation of TEM.	09	L1	CLO 1
	or			
d)	Write a note on advantage and disadvantages of SEM.Explain Comparative account of SEM and TEM. Give application of TEM.	09	L2	CLO 1
Q.2	**Attempt the following**			
a)	What is STM? What are requirement for doing STM. Write a note on advantage and disadvantages of STM	08	L2	CLO 2
b)	What is adsorption? Write the difference between physisorption and chemisorption.Explain Langmuir Adsorption Isotherm.	08	L2	CLO 2
c)	Explain Principle of Energy dispersive analysis of X-rays(EDAX) and describe instrumentation and give advantages of EDAX.	09	L2	CLO 2
	or			
d)	Explain Principle of X-ray Flurorescence Spectroscopy (XRF) and describe instrumentation of wavelength dispersive XRF	09	L3	CLO 2

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Q.3 Attempt the following

a)	Derive the Bragg's law and give applications of X-ray diffraction techniques.	08	L2	CLO 3
b)	Explain types of unit cell and about bravais lattice in a crystal. Show the crystal planes from the (221) (111) and (200) miller indices.	08	L2	CLO 3
c)	Sketch the neat labeled diagram and explain the instrumentation of XRD. Explain in brief like origin of X-ray, filter, collimator, monochromator and detector used in XRD	09	L2	CLO 3
	or			
d)	The X-ray diffraction pattern of a metal was obtained using X-rays with wavelength 1.5406 Å. The first six lines occurred at the following 2θ angles: 27.80, 32.20, 46.20, 54.80, 57.45 and 67.45. Determine the type of the system and calculate the unit cell parameter value 'a'.	09	L3	CLO 3

Q.4 Attempt the following

a)	Describe working of X-ray discharge tube. Discuss with advantages and disadvantages of the XPS.	08	L2	CLO 4
b)	i) What is chemical shift in ESCA? Give applications of X-ray photoelectron spectroscopy in chemical analysis. ii) Write down electronic structure of sodium element and describe production and interpretation of photoelectron spectrum of sodium.	08	L2	CLO 4
c)	Describe construction and working of electron energy analyzer. Discuss advantages and disadvantages of the XPS.	09	L3	CLO 4
	or			
d)	State and explain photoelectric effect and Koopmans theorem. Explain factors affecting intensity and position of peaks in the photoelectron spectrum.	09	L2	CLO 4

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