

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)

CLASS: IMSc  
BRANCH: PHYSICS

SEMESTER: VI  
SESSION: SP/2023

SUBJECT: PH321 ADVANCED EXPERIMENTAL TECHNIQUES (AET)

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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		CO	BL
Q.1(a)	Briefly explain about the production of x ray	[5] 1	2
Q.1(b)	The powder pattern of aluminum, made with $\text{CuK}\alpha$ radiation, contains ten lines, whose $\sin^2\theta$ values are 0.1118, 0.1487, 0.294, 0.403, 0.439, 0.583, 0.691, 0.727, 0.872 and 0.981, Index these diffraction lines.	[5] 3	3
Q.2(a)	Schematically show the experimental set-up for X-ray photoelectron spectroscopy (XPS). Briefly explain the working principle of XPS.	[5] 2	2
Q.2(b)	What is Raman scattering? Mention a few important characteristics that can be determined from Raman spectroscopy. How are the Auger electrons generated?	[5] 2	2
Q.3(a)	With a neat sketch briefly explain the working of DTA	[5] 2	2
Q.3(b)	Explain, how one can determine a polymorphic transformation from thermogram	[5] 2	5
Q.4(a)	What is corrosion? Explain its types and their prevention	[5] 3	2
Q.4(b)	Briefly explain about the application of cyclic voltammetry	[5] 3	5
Q.5(a)	Describe thin film deposition using the magnetron sputtering method (with schematics).	[5] 2	2
Q.5(b)	Why is ultra-high vacuum (UHV) required for surface studies? What are the different methods to produce a clean surface under UHV? Explain the basic differences between the chemical vapor deposition (CVD) and the physical vapor deposition (PVD).	[5] 2	2

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