Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, Nov. / Dec. 2024

B.E. Materials Science and Engineering

V[th] Semester

Sub. Code & Name: ML5502 & Characterisation of Materials **Date :04-12-2024**

(Regulation 2019)

Time: 3hrs Max. Marks: 100

CO 1	To educate students on various techniques of structural characterization of materials.
CO 2	To enable student to interpret microstructure, crystal structure and surface structure of materials.
CO 3	To impart knowledge on X-Ray diffraction techniques and analysis
CO 4	To impart knowledge on different electron microscopy techniques used for characterization
CO 5	To impart knowledge on techniques of elemental chemical composition and structure of surface.

BL – Bloom's Taxonomy Levels

(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analyzing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	What are the purposes of materials characterization?	2	1	L2
2	How to improve resolution?	2	1	L4
3	What is the frequency (per second) and energy per quantum (in joules) of x-ray beam with wavelengths of 0.71Å (Mo Kα) and 1.54Å (Cu Kα)?	2	2	L5
4	Derive the Braggs law.	2	2	L2
5	What are the differences between anisotropy and texture in materials?	2	3	L2
6	How residual stresses are measured in the welded metals?	2	3	L3
7	What are the difference between SE and BSE images in SEM?	2	4	L2
8	What is tunneling effect?	2	4	L4
9	What are the disadvantages of EDS?	2	5	L2
10	Aüger electron processing needs three electrons. Justify ?	2	5	L3

PART- B (5 x 13 = 65 Marks)

(Restrict to a maximum of 2 subdivisions)

Q. No	Questions	Marks	CO	BL
11 (a)	Explain in detail about optical properties of a microscope?	13	1	L2
	OR			
11 (b)	How to enhance the contrast in a microscopy and explain any one contrast enhancing technique?	13	1	L3
12 (a)	Explain the various diffraction methods in XRD?	13	2	L2
	OR			
12 (b)	Calculate the structure factor for SC, BCC and FCC?	13	2	L3
13 (a)	Find out the crystal structure for the given following 2θ positions : 38.46, 55.54, 69.58, 82.46, 94.94, 107.64, 121.36.	13	3	L5
	OR			
13 (b)	Explain the method of measuring the precise lattice parameter from XRD data?	13	3	L3
14 (a)	With a neat sketch explain the construction and operation of transmission electron microscope (TEM)?	13	4	L2
	OR			
14 (b)	Describe the working principle, construction and uses of AFM?	13	4	L2
15 (a)	What is photo electric effect? Explain UPS technique with a neat sketch?	13	5	L2
	OR			
15 (b)	Explain in-detail about LEED ?	13	5	L2

PART- C (1 x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	Describe the working principle, construction, advantages, disadvantages and applications of Metallurgical microscope?	15	1	L2