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Question Paper Code: U5112

M.E. DEGREE EXAMINATION, APRIL/ MAY 2025

Elective

CAD / CAM

21PCD512–MATERIAL TESTING AND CHARACTERIZATION

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 20 = 100 Marks)

1. (a) With a neat sketch, explain the construction and working of Atomic force microscopy (AFM) and its applications in various fields of study. CO1- U (20)

Or

- (b) If you need to study a multilayered sample using SEM. How would you use different electron signals (secondary, backscattered, X-rays) to analyze both surface details and deeper material composition? CO1- U (20)

2. (a) Describe the differences between single-crystal X-ray diffraction (SC-XRD) and powder X-ray diffraction (PXRD). In what situations is each method preferred? CO2- App (20)

Or

- (b) An XRD experiment yields a diffraction pattern with several peaks at different angles. How would you apply Bragg's law to calculate the interplanar spacing of the crystal lattice from these peaks? Detail the steps of your calculation, including any necessary assumptions. CO2- App (20)

3. (a) Give the essential differences between a DTA and DSC. Which method you will prefer for quantitative purposes and why? CO2- App (20)

Or

- (b) Discuss the technique used to measure the viscoelastic properties of materials particularly polymers. CO2- App (20)

4. (a) In a steel industry, iron rod is manufactured. Now the iron rod is need to quality check. What is the quickest test available for testing various properties? CO3- App (20)

Or

- (b) Discuss about the Correct Hardness Testing Method for your metals application. CO3- App (20)

5. (a) Discuss the influence of stress intensity factor on fatigue crack growth in all the three regions. CO1- U (20)

Or

- (b) Explain the methodology of conducting rotating beam fatigue testing and the generation of S-N curve. Also discuss about the pitfall of S-N curve technique. CO1- U (20)