Question Paper Code:U3912

M.E. DEGREE EXAMINATION, APRIL 2024

Second Semester

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 functions of various components   C01-U   (20)
         and working principle of scanning electron microscope

                                              Or

    (b) Outline how electrons are scattered by an amorphous material and a   C01-U   (20)
         crystalline lattice with reference to the modes of imaging of the
         transmission electron microscope (TEM), make distinction between
         the processes of elastic and inelastic scattering.

2. (a) Below are the listed diffraction angles for the first three peaks (first   C02-App   (20)
         order) of the x-ray diffraction pattern for some metal.
         Monochromatic radiation having a wavelength of 0.1542 nm was
         used. Determine whether this metal's crystal structure is FCC, BCC
         or neither FCC nor BCC and explain the reason for your choice.

Peak Order	Diffraction angle (2Θ)
1st	38.6
2nd	55.7
3rd	70.0

                                              Or

    (b) Explain the physical information contained in measured standard   C02-App   (20)
         X-ray powder diffraction pattern. Also give the information,
         describing the microstructure of material can one obtain from the
         peak positions, peak intensities and peak profiles

3. (a) Identify the technique which is useful for analyzing the chemical composition of smaller particles, typically 10 -50 microns, as well as larger areas on the surface and give examples.   C02-App   (20)

Or

(b) Give the essential differences between a DTA and DSC. Which method you will prefer for quantitative purposes and why?   C02-App   (20)

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

Or

(b) 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)

5. (a) (i) A component undergoes a cyclic stress with a maximum value of 750 MPa and a minimum value of 75 MPa. The component made from steel with an ultimate stress of 1000 MPa and endurance limit stress of 400 MPa and undergoes fully reversed stress at 1000 cycles. Using the Goodman's relationship determine the life of the component.   CO3-App   (12)

(ii) Sketch any four fatigue test specimens geometry as per standards.   CO3-App   (8)

Or

(b) Discuss the methodology of conducting plate bending fatigue test and how to generate S-N curve. Give the S-N curves for mild steel and aluminium.   CO3-App   (20)

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