JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION-2025

PhD II Semester (CE)

COURSE CODE (CREDITS): 24P1WCE232 (3) MAX. MARKS: 35

COURSE NAME: Characterization of Materials

COURSE INSTRUCTORS: Dr. Saurav MAX. TIME: 2 Hour

Note: *(a) All questions are compulsory.*

(b)Marks are indicated against each question in square brackets.

Q.No	Question	CO	Marks
Q1	Given a cubic crystal with a lattice constant a = 3.615 A^{o}, calculate the inter planar spacings d for the following planes: (212) and (223). Use the formula for cubic systems:	3	4
Q2	Explain the significance of surface area measurement in assessing the reactivity and hydration behavior of cementitious powders. Describe how particle shape influences the accuracy of laser diffraction measurements.	4	6
Q3.	A cement sample has a specific surface area (SSA) of 350 m^2/kg and a density (ρ) of 3.1 g/cm^3. The median volume diameter (D_{v50}) is 15 μm. Calculate the agglomeration factor	4	3
Q4.	For a cement powder with density 3.15 g/cm^3, largest particle class ranging from 0.02 cm to 0.01 cm, variance (σ_i^2) = 0.0025, and mass fraction w_1 = 0.1, calculate the minimum sample weight (W_m) for a 5% tolerated error.	4	5
Q5.	Evaluate the impact of degassing temperature on the SSA values of gypsum-containing cementitious materials. What precautions must be taken?	4	5
Q6.	Explain what thermal analysis is, list the major thermal analysis techniques discussed, describe the principle behind Differential Thermal Analysis (DTA), and mention two common reference materials used in DTA	3	5
Q7.	Explain how a thermocouple works, differentiate between DSC and DTA techniques, describe the types of phenomena that cause heat changes in materials, and discuss why particle size affects the DTA curve	3	5
Q8.	If a DSC test shows a peak area A = 25 mW·s, Sample mass m = 10 mg, and calibration coefficient K = 0.2 J/(mg·mW·s), calculate the heat of transition (ΔH)	3	2