Ref. No.: Ex/Che/PE/B/T/414A/2024(S)

B.E. CHEMICAL ENGINEERING FOURTH YEAR FIRST SEMESTER SUPPLEMENTARY EXAM 2024

INTERFACIAL SCIENCE AND ENGINEERING

Time – 3 hrs FM-100

CO-1	(i) Spherical particle, suspended in water, is placed in a centrifugal field. The particle moves from 5 cm to 7 cm in 3 minutes. If the rotational speed of the particle is given as 500 rad/sec, find out the sedimentation coefficient. Also find out the diameter of the particle if the density of the particle is 8000 kg/m^3.	10
	(ii) Write short notes on: Hofmeister series, Significance of Mark Howink equation.	10
CO-2	(i) The Lennard-Jones parameters for argon are: A =1.2*10-^{77} J m^6 and B =1.6*10^{-134} J m^{12}. Calculate the distance at which the energy will be minimum. Calculate the minimum energy.	8
	(ii) Derive the mathematical expression for Guoy Chapman equation. Write short notes on Hydration force	7+5
CO-3	(i) Define Capilary constant. Estimate the height of water inside a capillary tube of 1.0 mm radius. Take: Surface Tension= 80mN/m and assume zero contact angle.	5
	(ii) How pressure Difference across a curved surface is related with radii of curvature.	10
	(iii) For mercury and water, the values of γ_d are 200 mN/m and 20 mN/m, respectively at 293 K. Using these values, compute the interfacial tension between waterand mercury at the same temperature. Compare your result with the experimental value of 426 mN/m. Given: The surface tensions of water and mercury at 293 K are, γ_W =70 mN/m $\gamma_{Hg=}$ 470 mN/m	5
CO-4	(i) The aggregation number of sodium dodecyl sulfate micelle in water is 100. Calculate the packing parameter, and predict the shape of the SDS micelles.	10
	(ii) The interfacial tension between oil and water in 80 mN/m. The oil density is 700kg/m^3. If angular velocity is 800 rad/sec. Calculate the radius of cylindrical drop.	10
CO-5	(i) Describe various imaging modes associated with AFM. Write short note on "alignment" operation of AFM.	10
	(ii) Draw different kinds of adsorption isotherms. Write down the assumptions made in Langmuir adsorption isotherms and shortcomings of the samee	10