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

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

INTERFACIAL SCIENCE AND ENGINEERING

Time – 3 hours FM-100

CO-1	(i) Spherical particle, suspended in water, is placed in a centrifugal field. The particle moves from 6 cm to 7 cm in 120 second. If the rotational speed of the particle is given as 600 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 (any two): Donnan Equilibrium, Significance of mark howink equation, Relationship between zeta potential and electrophoresis.	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) Find out the ratio of VDW forces acting between sphere and parallel half space and plane parallel half spaces.	5
	(iii) Derive the mathematical expression for Debye-Huckel approximation.	7
CO-3	(i) Define Capilary constant. Estimate the height of water inside a capillary tube of 0.70 mm radius. Take: Surface Tension= 70 mN/m and assume zero contact angle.	5
	Or	
	Write down the physical significance of Bond number	
	(ii) Derive the Effect of surface curvature on vapor pressure. Describe the key features from the derived equation.	10
	(iii) Estimate the surface tension of 2-methyl -1-butanol at 298 K using the parachor data. Given: the density of 2-methyl -1-butanol is 815 kg/m^3.	5
CO-4	(i) The aggregation number of sodium dodecyl sulfate micelle in water is 90. Calculate the packing parameter, and predict the shape of the SDS micelles.	10
	(ii) How equivalent conductivity, Surface tension and turbidity carry near CMC? How the size and shape of the micelles depend on the properties of the solution such as the concentration of electrolyte and the pH of the solution?	10
CO-5	(i) What are the different components of atomic forced microscopy?? Describe various imaging modes associated with AFM. Write short note on "alignment" operation of AFM.	10
	(ii) What are the assumptions made in BET theory and derive the mathematical expression for BET adsorption isotherm.	10