BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BE **SEMESTER : VII**
BRANCH: CHEMICAL ENGG / CEP&P **SESSION : MO/19**

SUBJECT: CL7035 COLLOID AND INTERFACIAL ENGINEERING

TIME: 3 HOURS **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a)	Why the Brownian motion is observed in colloid particles?	[2]
Q.1(b)	A spherical particle of 1cm in diameter is broken uniformly into a large number of spherical particles such that the diameter of each of the new particle is 1x10-7 m. What is the total surface area of new particle?	[4]
Q.1(c)	Write short note on electrophoresis and sedimentation potential.	[6]
Q.2(a)	What is Stokes Einstein equation?	[2]
Q.2(b)	HLB of Tween 80 = 15, HLB of Span 80 = 4.3, We need 2 g of Tween 80 and Span 80 blend having a HLB value of 10.6. How much Tween 80 and Span 80 are needed?	[4]
Q.2(c)	What are non DLVO forces? Why are they called for? Give two examples.	[6]
Q.3(a)	What is terminal velocity? What is Creaming?	[2]
Q.3(b)	A spherical particle suspended in water is placed in a centrifugal field. The diameter of the particle is $1X10^{-7}$m. What would be the rotational speed so that the particle moves from 6.5cm to 7cm in 60s? Density of particle is 7500kg/m^3.	[4]
Q.3(c)	Define wash burn equation and explain its significance.	[6]
Q.4(a)	Explain the main features of Gemini surfactant.	[2]
Q.4(b)	Calculate the value of the London dispersion force constant for methane using the constants of van-der waals equation of state. a=0.228m^6Pamol^{-2}, b=4.3x10^{-5} m^3/mol	[4]
Q.4(c)	Discuss Winsor classification of surfactants	[6]
Q.5(a)	What is HLB? What is its importance?	[2]
Q.5(b)	Estimate the surface tension of ethyl alcohol at 298 K using the parachor data. Given: the density of ethanol is 800 kg/m3. Parachor for ethyl alcohol is 22.281x10^{-6}	[4]
Q.5(c)	What is Hamaker constant? Explain its behavior towards spreading of the liquid.	[6]
Q.6(a)	Differences between flocculation and coagulation.	[2]
Q.6(b)	Calculate the equilibrium radius of the microemulsion droplets at 298K if the interfacial tension between oil and water is 50mN/m, volume fraction of the droplets is 0.03, and the surfactant concentration in the microemulsion is 100mol/m3.	[4]
Q.6(c)	Give basic feature of L-B film balance. Draw a ∏ Vs A (surface pressure Vs molecular area) of stearic acid in Langmuir-Blodgett film balance.	[6]
Q.7(a)	Write the expressions for maximum bubble pressure method.	[2]
Q.7(b)	Estimate the van der Waals force between two sapphire spheres of 1 mm radius which are 1 nm apart *in vacuo*. A_H=15.6x10^{-20} J	[4]
Q.7(c)	Give classification of biosurfactants. What are the advantages and limitations of biosurfactants?	[6]

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