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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

August 2024 Supplementary Examinations

Programme: B.E. **Semester: VI**
Branch: Chemical Engineering **Duration: 3 hrs.**
Course Code: 19CH6DELD2 **Max Marks: 100**
Course: Interfacial Phenomena

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Explain the interfacial phenomena causing the Marangoni effect with a neat sketch. **06**

b) A needle has a length of 0.032 m. When placed gently on the surface of water, this needle will float. What is the weight of the heaviest needle that will float? **04**

c) With the help of plots of force versus time, illustrate the Du-Nouy ring method for the measurement of surface tension. **10**

OR

2 a) Distinguish reversible and irreversible colloids with the help of a specific example for each. **04**

b) State the Schulze-Hardy rule. What is its significance? **06**

c) With the help of a neat sketch, illustrate the capillary rise method for the measurement of surface tension. **10**

UNIT - II

3 a) Derive the expression for pressure jump across a curved surface with the help of a neat sketch. **10**

b) Explain capillary condensation with the help of the relevant equation and a neat sketch. **10**

UNIT - III

4 a) Derive the Young-Dupre equation with the help of a neat sketch. **05**

b) Calculate the HLB value of a mixture containing 75% sodium dodecyl sulphate and 25 % potassium laurate (Lauric acid Formula: $C_{12}H_{24}O_2$). **05**
Data:

Group	Group number
$-SO_4^- Na^+$	38.7
$-COO^- K^+$	21.1
$-COO^- Na^+$	19.1
Sulphonate	11
–N (tertiary amine)	9.4
Ester (sorbitan ring)	6.8
Ester (free)	2.4
–COOH	2.1
–OH (free)	1.9
–O–	1.3
–OH (sorbitan ring)	0.5
$-CH_3$	0.475
$-CH_2-$	0.475
–CH=	0.475
$-(CH_2-CH_2-CH_2-O-)$	0.15

c) With the help of neat sketches, illustrate the emulsion breakdown process. **10**

OR

5 a) Define contact angle. How does it affect wetting? **06**

b) What are the cloud point and haze point? **04**

c) Derive the expression for 'Critical Radius' in the characteristic behavior of Ostwald Ripening. **10**

UNIT - IV

6 a) With the help of neat sketch, explain the formation and structure of the electrostatic double layer. **10**

b) Define electrokinetic phenomena. Illustrate the phenomenon of electrophoresis in detail with the help of a sketch. **10**

UNIT – V

7 a) Elucidate how surfactants are classified based on the type of their head groups. Give specific examples and applications of each group. **10**

b) State the principle and demonstrate the mechanism of liquid membrane permeation, with a neat schematic diagram. **10**

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