



## End Semester Examination – Nov/Dec – 2016

<b>Code</b> :	<b>14FP2010</b>	<b>Semester</b> :	<b>2016-17 ODD</b>
<b>Sub. Name</b> :	<b>Unit Operations in Food Process Engineering-II</b>	<b>Duration</b> :	<b>3hrs</b>
		<b>Max. marks</b> :	<b>100</b>

### ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	Explain the principle and theory of diffusion process	CO1	10
	b.	Explain the flash distillation process with a neat diagram.	CO2	10
(OR)				
2.	a.	Explain the batch distillation process with a neat sketch.	CO2	10
	b.	Calculate the vapour and liquid compositions in equilibrium at 95°C for benzene-toluene using the vapour pressure at 101.32 kPa. The partial pressures of benzene and toluene are 155.7 kPa and 63.3 kPa respectively.	CO2	10
3.	a.	Discuss the principles of extraction and briefly explain the applications of extraction in food processing.	CO1	10
	b.	Explain the functioning of single stage batch extraction process with diagram.	CO2	10
(OR)				
4.	a.	Explain in detail about the Super Critical Fluid Extraction process with a neat diagram and list out the applications of Super Critical Fluid Extraction in food processing.	CO2	20
5.	a.	Explain forced circulation liquid evaporator crystallizer with a diagram.	CO2	10
	b.	What is the size of a nucleus of a sugar crystal in equilibrium at 20°C with mother liquor at 115% supersaturation? The surface tension at the crystal-liquid interphase is estimated to be 0.3 ergs/cm <sup>2</sup> . The density of the sugar crystal is 1600 kg/m <sup>3</sup> and molecular weight of sucrose(M) is 342. Consider the value of V as 1.	CO3	10
(OR)				
6.	a.	Write a note on the principle of crystallization.	CO1	5
	b.	Describe a batch crystallizer with a neat diagram and explain its application in food processing.	CO2	10
	c.	Discuss the importance of mixing and agitation in crystallization process.	CO2	5
7.	a.	Explain the solvent transport phenomena in ultra filtration process.	CO2	10
	b.	The concentration of whey is being accomplished by using an ultrafiltration membrane to separate water. The 400 kg/hour of feed stream has 7 % solids and is being increased to 22 % total solids. The membrane tube has a 6 cm inside diameter and the pressure difference is 2100 kPa. Estimate the flux of water through the membrane and length of the membrane tube when the hydraulic permeability is 3.7x10 <sup>-5</sup> kg of water/m <sup>2</sup> k Pa. s	CO3	10
(OR)				
8.	a.	List out the desirable characteristics of membrane configurations? Describe briefly the spiral wound and tubular membrane configurations.	CO1	10
	b.	An ultrafiltration membrane was examined microscopically and found to have about 1,50,000 pores with an average diameter of 0.8 x 10 <sup>-6</sup> m per mm <sup>2</sup> of membrane surface. The thickness of the membrane is 160x10 <sup>-6</sup> m. The viscosity	CO3	10

		of the permeate is 0.0013 Pa.s. Estimate the following : a) Porosity of the membrane ( $\epsilon$ ), b) Hydraulic Permeability ( $L_P$ ) and c) Permeate Flux(J) for a Trans membrane Pressure Difference( $\Delta P_{TM}$ ) of 1.5 Pa.		
		<b><u>Compulsory:</u></b>		
9.	a.	Explain the process of adsorption in columns.	CO1	10
	b.	Discuss the working of bubble columns for gas absorption process with neat sketch.	CO2	10

ALL THE BEST