Reg.No. _____

Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – Nov/Dec – 2016

Semester : 2016-17 ODD

Code : 14FP3001 **Duration : 3hrs**

Sub. Name : SEPARATION PROCESSES IN FOOD ENGINEERING **Max. marks : 100**

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	Two tanks containing liquids of different densities are located at same level. Derive an expression to compute the differential pressure between two tanks connected with a U-tube differential manometer filled with mercury as manometric fluid.	CO1	10
	b.	A pipe of diameter 40 mm conveys fruit juice concentrate at a flow rate of 0.3 m^3/min. The specific gravity of the juice is 1.2 and the viscosity is 0.0019 Pa. s. Determine the type of flow of the concentrate in the pipe.	CO2	10
		(OR)		
2.	a.	An evaporator is used to concentrate sugar solution. A feed of 20,000 kg/day of a solution containing 36% sugar is evaporated producing 76% of sugar solution. Draw the mass balance diagram and calculate the weight of solution produced and amount of water removed.	CO3	10
	b.	A 50 cm diameter pipe conveying liquid food converges in to 40 cm diameter at the other end and then branches into two pipes of diameters 25 cm and 15 cm respectively. If the average velocity in the 50 cm pipe is 4 m/s, compute the following : a) the discharge in the pipe, b) the velocity at the converging end and c) the velocity in the 25 cm pipe if the average velocity in the 15 cm pipe is 2 m/s.	CO2	10
3.	a.	Explain material balance in screens and derive the formula for screen effectiveness.	CO1	10
	b.	Explain the working of rotary vacuum filter press with a neat sketch.	CO2	10
		(OR)		
4.	a.	Fruit juice is filtered using a filter press having a cross sectional area of 3 m^2 under a gauge pressure of 2 x 10^5 Pa. The feed has a solid content of 20 g per litre whose density is 900 kg/m^3. The viscosity of the filtrate is 0.001 Pa. s. The volume of the filtrate collected with time are as given below: T, min: 9, 27, 56, 92 V, litre: 5, 10, 15, 20 Determine the specific cake resistance(α) and equivalent cake thickness(L_m).	CO3	20
5.	a.	Derive the expression to find the settling velocity of particles in a centrifuge.	CO1	10
	b.	A basket centrifuge with solid walls of 0.8 m height contains 90 kg of water. The centrifuge rotates at 2500 rpm. Consider the density of water as 1000 Kg/m^3. Calculate the following : a) Angular Velocity, b) Inner radius of the annular water mass ($r_2^2 - r_1^2$) and c) The pressure (P) developed at the walls of the centrifuge.	CO3	10
		(OR)		

6.	a.	Describe in detail about the principle and working of basket type centrifuge.	CO1	10
	b.	In the refining process of edible oil, an aqueous phase is being separated from the oil phase by using a centrifuge. The density of the aqueous phase is 985 kg/m^3 and that of oil is 864 kg/m^3. The radius for the overflow of heavy liquid has been set at 12.82 mm and the outlet for the light liquid at 12.26 mm. Calculate the location of the neutral zone of interface of the two phases.	CO2	10
7.	a.	The concentration of milk protein is being accomplished by using an ultrafiltration membrane to separate water. The 20 kg/min 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 $4x10^{-5}$ kg of water/m^2k Pa. s	CO3	10
	b.	Explain the spiral and tubular membrane configurations with figures.	CO2	10
		(OR)		
8.	a.	Explain the solvent transport process in reverse osmosis and application of the process.	CO2	10
	b.	A microfiltration membrane was examined microscopically and found to have about 2,20,000 pores with an average diameter of 0.7 x 10^{-6} m per 2mm^2 of membrane surface. The thickness of the membrane is 170 x 10^{-6} m. The viscosity of the permeate is 0.0018 Pa.s. Estimate the following : a) Porosity of the membrane (€), b) Hydraulic Permeability (L_P) and c) Permeate Flux(J) for a Trans membrane Pressure Difference(ΔP_{TM}) of 1.5 Pa.	CO3	10
		Compulsory:		
9.	a.	Explain the process of Interphase moisture transport in foods.	CO1	10
	b.	Describe the process of diffusion in porous foods.	CO2	10

ALL THE BEST