Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_

****

**End Semester Examination – Nov/Dec – 2017**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **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. | Derive the expression to compute the differential pressure between two tanks located at different levels and are connected with a U-tube differential manometer. The tanks are flowing with liquids of different densities and the manometric fluid is mercury. | CO1 | 10 |
| b. | A 50 cm diameter pipe carrying fruit juice branches out into two pipes with diameters 20 cm and 15 cm respectively. If the velocity in the 50 cm diameter pipe is 6 m/s, find the discharge in this pipe. Also determine the velocity in the 15 cm diameter pipe if the average velocity in 20 cm diameter pipe is 3.5 m/s. | CO2 | 10 |
| (OR) | | | | |
| 2. | a. | Find the expression to compute the velocity of flow in pipe by using Pitot tube. | CO2 | 10 |
| b. | A quantity of 1000 kg of soyabean contains 18% of oil and is crushed in an oil expeller. The crushed cake has an oil content of 6%. It is then extracted with hexane to produce a meal containing 0.5% oil. Calculate the quantity in each process. | CO2 | 10 |
|  |  |  |  |  |
| 3. | a. | Determine the formulae for the constant volume and constant pressure filtration processes. | CO1 | 15 |
|  | b. | A sedimenter is used to settle the suspended solids in a fruit juice and to decant the clear decoction. The suspended solids have an average diameter of 1.5x 10-5 m. Find the terminal velocity of the particles if the density of the solids is 1250 kg/m3 and the specific gravity of the juice is 1.12 and its viscosity is 1.2x10-3 Pa.s. | CO2 | 5 |
| (OR) | | | | |
| 4. | a. | Derive Stoke’s law expression for the settling velocity of a particle in a fluid under sedimentation process. | CO1 | 10 |
|  | b. | Explain the working of rotary vacuum filter press with a neat sketch. | CO2 | 10 |
|  |  |  |  |  |
| 5. | a. | Derive the formula to find the pressure and residence time of particles in a centrifuge. | CO2 | 10 |
|  | b. | Fruit juice with a density of 1060 kg/m3 and viscosity of 1.5 x 10-3 Pa.s contains 4% solids which have a density of 1170 kg/m3 is clarified in a bowl centrifuge. The operating volume of the centrifuge is 0.2 m3 and the speed is 18000 rpm. The bowl has outlet diameters of 5 cm and 3 cm for the solids and liquids respectively. The particle size(Dp) is 3.4 x 10-6 m. Compute the following by using the given data : i. The Angular Velocity ii. The Volumetric flow rate (Q) in m3/s and iii. Time required for centrifuging the calculated quantity of flow. | CO3 | 10 |
| (OR) | | | | |
| 6. | a. | Describe in detail about the principle and working of Tubular bowl centrifuge. Enlist the applications of centrifugation process in food industries. | CO1 | 15 |
|  | b. | A bowl centrifuge is used for separation of cream from milk which has the discharge diameters of 12 cm and 16 cm. If the density of milk is same as that of water and the cream density is 850 kg/m3, calculate the radius of the neutral zone in the centrifuge. | CO2 | 5 |
|  |  |  |  |  |
| 7. | a. | Write a note on different membrane materials. | CO1 | 10 |
|  | b. | Explain i. tubular and ii. plate frame membrane configurations with necessary figures. | CO2 | 10 |
| (OR) | | | | |
| 8. | a. | Explain the solvent transport process in microfiltration and application of the process in food industries. | CO1 | 10 |
|  | b. | A membrane for micro filtration was examined microscopically and found to have about 1,50,000 pores with an average diameter of 0.9 μm per mm square of membrane surface. The thickness of the membrane is 180 μm. Estimate the hydraulic permeability of the membrane to water, using the Hagen–Poiseuille capillary model. | CO2 | 10 |
|  | | **Compulsory:** |  |  |
| 9. |  | Explain in detail about the diffusion of aroma compounds in food materials. | CO2 | 20 |

ALL THE BEST