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



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **17FP2016** | **Duration :** | **3hrs** |
| **Sub. Name :** | **UNIT OPERATIONS IN FOOD PROCESS ENGINEERING – II** | **Max. Marks :** | **100** |

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

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Justify how the molecular diffusion in gases have same diffusion coffecient. | CO1 | 10 |
| b. | Construct the steam distillation unit and deduce the equation for the mass fraction. | CO6 | 10 |
| **(OR)** | | | | |
| 2. | a. | Dicuss the concept of ideal stages and derive material balance and operating line equation. | CO3 | 10 |
| b. | A steam distillation process is used for separating out an oil from clove buds by passing steam into the chamber at 60 kPa at the rate of 110 kg/h for 10 minutes. If the molecular weight of the clove oil is 165, find the quantity of clove oil distilled. Assume the total pressure as 101.3 kPa. | CO5 | 6 |
| c. | Develop a diagram showing q-lines for different feed conditions. | CO1 | 4 |
|  |  |  |  |  |
| 3. | a. | Distinguish between the extraction and distillation. | CO2 | 10 |
| b. | Discuss the role of extraction in food processing industry. | CO1 | 10 |
| **(OR)** | | | | |
| 4. |  | Explain the super critical fluid extraction process in detail with a neat sketch and mention its merits and demerits. | CO5 | 20 |
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| 5. | a. | Analyze the role of different types of packing materials and explain the working of packed tower. | CO6 | 10 |
| b. | Describe the different types of tray tower for absorption. | CO5 | 10 |
| **(OR)** | | | | |
| 6. | a. | Interpret the following:   1. Application of adsorption 2. Nature of adsorbent 3. Gerenally used adsorbent 4. Types of adsorption | CO2 | 3  2  3  2 |
| b. | Demonstrate the working of fixed bed adsorption equipment. | CO3 | 10 |
|  |  |  |  |  |
| 7. | a. | Recommend a suitable Batch crystallizer and Draft tube Baffle Crystallizer (DTB) for food processing industry and justify . | CO6 | 14 |
| b. | Calculate the nucleation rate of magnesium chloride crystals at 27°C which have a surface tension of 6.50 ergs/cm2. The solution has a fractional super saturation of (s value) of 0.035. the density of MgCl is 2.32 x 103 kg/m3. and molecular weight of MgCl is 95.23. | CO4 | 6 |
| **(OR)** | | | | |
| 8. | a. | An ultrafiltration membrane was examined microscopically and found to have about 1,80,000 pores with an average diameter of 0.6 x 10-6 m per mm2 of membrane surface. The thickness of the membrane is 140x10-6 m. The viscosity of the permeate is 0.0013 Pa.s. Estimate the following:  i) Porosity of the membrane (€),  ii) Hydraulic Permeability (LP)  iii) Permeate Flux (J) for a Trans membrane Pressure  Difference (∆PTM) of 1.5 Pa. | CO4 | 10 |
| b. | Apply your knowledge in explaining concentration polarization. | CO3 | 10 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Appraise the role of reverse osmosis in desalination of sea water and brackish water. | CO5 | 15 |
| b. | Estimate the osmotic pressure of citrus juice with 12% total solids at 25℃. The citrus juice has the density of 1050 kg/m3, the value of Gas constant = 8.314 (m3 kPa/kg mol K) and molecular weight is 180 kg/kg mol. | CO4 | 5 |