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| **Name:**<br>**Enrolment No:** | UPES<br>UNIVERSITY WITH A PURPOSE |

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**
**Online End Semester Examination, May 2021**

**Course: Novel Separation Processes (Program Elective IV/V)** **Semester: VIII**
**Program: B.Tech. Chemical spl RPC** **Time: 3 hrs**
**Course Code: CHCE3024** **Max. Marks: 100**
**Assume suitable data, if necessary.**

**SECTION A (Type the answer type)**

| Q. No. | Short answer type questions. Each carries 5 marks. 5X6 = 30 marks | Marks | CO |
|---|---|---|---|
| Q 1 | Enlist the key and auxiliary operations pertaining to a chemical or biochemical plant. | 5 | CO1 |
| Q.2 | Define the terms,1) Membrane 2) Feed 3) Permeate and 4)Retentate | 5 | CO2 |
| Q.3 | Write down the definition of Adsorption and compare physical adsorption with chemical one. | 5 | CO3 |
| Q.4 | Discuss 'Electrophoresis' in brief. | 5 | CO4 |
| Q.5 | Enlist any five oils covered by Spill Prevention, Control and Countermeasures (SPCC) rule. | 5 | CO5 |
| Q.6 | Describe the properties of supercritical fluid solvents. | 5 | CO5 |

**SECTION B (Scan and upload type)**

| Q. No. | Medium answer type questions. Each carries 10 marks. 10X5 = 50 marks | Marks | CO |
|---|---|---|---|
| Q.1 | A feed F of 100 kmol/h of air containing 79 mol% $N_2$ and rest $O_2$ is to be partially separated by a membrane unit according to following cases. Calculate the amounts in kmol/h and compositions in mol% of the two products, Retentate and Permeate. The membrane is more permeable to $O_2$.<br>**Case1:** 50% recovery of $O_2$ to the permeate and 87.5% recovery of $N_2$ to the retentate<br>**Case 2:** 50% recovery of $O_2$ to the permeate and 50 mol% purity of $O_2$ in the permeate | 10 | CO1 |
| Q.2 | Describe with a well-labeled sketch, a hollow fibre membrane module w.r.t. construction, working and applications. | 10 | CO2 |

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|---|---|---|---|
| **Q.3** | A sample containing compounds A and B is analyzed in a chromatographic column, ** cm long. The mobile phase velocity is 0.15 cm/s. The capacity factors of A and B are 9 and 6.67 respectively. Calculate the difference in the retention times of the compounds in min. Also, calculate the selectivity of A over B.<br>The relationship between capacity factor k ’and retention time is given below.<br><br>$k' = \frac{t_R - t_m}{t_m}$<br><br>Where $t_R$ = Retention time of a compound<br>$t_m$ = Dead time for the mobile phase<br><br>** indicates last two digits of respective student’s SAP ID, in the same order. | **10** | **CO3** |
| **Q.4** | Describe with diagram, an electrodialysis process. | **10** | **CO4** |
| **Q.5** | Explain with diagram, the technique of pervaporation. | **10** | **CO5** |
| **SECTION-C (Scan and upload type)** | | | |
| **Q. No.** | **Long answer type question. It carries 20 marks. 1X20 = 20 marks** | **Marks** | **CO** |
| **Q.1** | Describe with diagram, air-stripping operation for nitrogen removal from industrial effluent. Also, give the design parameters for ammonia-stripping reactors along with the problems associated with them.<br><br>**OR**<br><br>Describe with flow diagram, ‘Batch Supercritical Fluid Extraction Plant’. Also, give the advantages of supercritical fluid solvents over liquid solvents. | **20** | **CO5** |