Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER– IV (New) EXAMINATION – WINTER 2019**

**Subject Code: 2142102 Date: 13/12/2019**

**Subject Name: Principles of Extractive Metallurgy**

**Time: 10:30 AM TO 01:00 PM Total Marks: 70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

| | | | MARKS |
|---|---|---|---|
| **Q.1** | **(a)** | Define Extractive metallurgy, calcinations and roasting. | **03** |
| | **(b)** | Explain briefly sources of metals. | **04** |
| | **(c)** | Justify the importance of Ellingham diagram for oxide system in extractive metallurgy | **07** |
| **Q.2** | **(a)** | Draw a simple flow sheet for extraction of Aluminum from bauxite ore. | **03** |
| | **(b)** | Write in detail about ion exchange process. | **04** |
| | **(c)** | Compare pyrometallurgy and hydrometallurgy in terms of merits and demerits. | **07** |
| | | **OR** | |
| | **(c)** | List out Pyro metallurgical processes. Differentiate between pelletizing and sintering. | **07** |
| **Q.3** | **(a)** | What is percolation leaching? List out advantage of it. | **03** |
| | **(b)** | Define smelting. Explain matte smelting process | **04** |
| | **(c)** | Discuss briefly fluidized bed roasting process. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Explain the reason of using autoclave in pressure leaching. | **03** |
| | **(b)** | Discuss Reduction smelting with suitable example. | **04** |
| | **(c)** | Describe the microbial leaching. Explain the effect of bacteria on leaching rate and extent of recovery | **07** |
| **Q.4** | **(a)** | Explain the Zone refining. | **03** |
| | **(b)** | During electrolysis of $CuSO_4$ 25 gms of copper is deposited at cathode. Calculate 1) Coulombs required to deposit given amount of copper 2)Time required to deposit given amount of copper when 3 amp of steady current is maintained. | **04** |
| | **(c)** | Write a note on fused salt electrolysis. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Draw flow sheet of extraction of Zinc. | **03** |
| | **(b)** | List out physical method of Refining. Explain selective distillation of impurities. | **04** |
| | **(c)** | Illustrate the kinetics of leaching with concentration profile of mineral surface. | **07** |
| **Q.5** | **(a)** | Differentiate between Order of reactions and Molecularity | **03** |
| | **(b)** | Describe theory of Absolute Reaction Rate. | **04** |
| | **(c)** | Explain Collision Theory of reaction kinetics. | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | Derive Arrhenius Equation | **03** |
| | **(b)** | Draw process flow sheet of Cu extraction with important parameters involved in the process. | **04** |
| | **(c)** | Differentiate between electro winning and electro reefing. | **07** |