Reg.No

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)
B.E. (Full Time) Degree – End Semester Examination – Nov/Dec 2024
VII Semester Material Sciences & Engineering Regulation 2019
ML 5702- NON FERROUS METALLURGY

Time: 3 hours | Answer all Questions | Max. Marks: 100

CO 1	Will be able to correlate the structure - property relations of various copper alloys with special emphasis on engineering applications.
CO 2	Will be able to compare the differences between various aluminium alloys with respect to their composition, properties and applications.
CO 3	Will be able to identify suitable magnesium and titanium alloys for applications which involves magnesium and titanium alloys.
CO 4	Will be able to classify the different types of Nickel and Zinc alloys and understand the implications of these compositions on the properties and applications of the various alloys
CO 5	Will be able to explain the importance of precious metals, their properties and applications as well as the properties and applications of Lead and Tin alloys.

BL - Bloom's Taxonomy Levels
(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analysing, L5 - Evaluating, L6 - Creating)

PART A -- (10X2= 20 Marks)

Q.NO	QUESTIONS	CO	BTL	MARKS
1	The solubility of tin in copper above 580°C _____ a. decreases b. increases c. remains constant d. none of the above	1	2	2
2.	Find In what way the Cu- Al phase diagram at 11.8% Al is similar to Fe-Fe_3C phase diagramat 0.8%C	1	2	2
3.	Recall the appearance of metastable phases instead of equilibrium Cu Al_2 phase at low temperature during the ageing of Al-4%Cu alloy	2	2	2
4.	.Which among the following is an example of a non heat-treatable Al alloy? a) Al-Cu b) Al-Li c) Al-Mg-Si d) Al-Mn Justify.	2	2	2
5.	Recall which of the following is a type of aluminum alloy with magnesium and write its composition a) Mag-Thor b) Magnox c) Birma bright d) Elektron	3	2	2
6.	In an alloy of A&B weighing 75 Kgs, the ratio of A:B is 8:7. After extracting certain amount of A, the ratio becomes 5:7.Find out how much of A was extracted?	3	2	2
7..	Differentiate between mineral, ore and metal	4	3	2
8.	Nickel alloys have very poor corrosion resistance.(a) True (b) False Why?	4	2	2
9.	Which of the following is an alloy of lead? Mention its composition a) Vitallium b) Brass c) Invar d) Solder	5	2	2
10.	Analyse the terms Tin Cry and Tin disease	5	2	2

PART B (5X13 = 65 Marks)

Q.NO	QUESTIONS	CO	BTL	MARKS
11a (i)	Identify the alloys belonging to alpha and alpha-Beta brasses and mention their characteristics, chemistry and applications.	1	3	6
(ii)	Explain with a sketch how Cu alloys are classified. High light the chemistry, characteristics and applications of any 2 alloys in each of this	1	3	7

	classification.			
	OR			
11b (i)	Explain how Copper alloys are designated with an example	1	3	6
(ii)	Sketch the phase diagram of a Cu-Zn alloy system and detail the information one can infer from this system	1	3	7
12a (i)	Give a detailed description on coherent and non coherent precipitate structures during aging	2	3	6
(ii)	Explain with a suitable equilibrium diagram the precipitation hardening heat treatment of cast Al alloy products. Describe the mechanism behind aging process	2	3	7
	OR			
12b (i)	Prepare a detailed report on why Al alloy products are widely preferred in automotive and aeronautical fields	2	3	6
12b(ii)	Classify the ores of Aluminum and elaborate how it is extracted from its predominant ore	2	3	7
13a(i)	Explain with a flow chart the Magnesium extraction process by Pidgeon process	3	4	6
13a(ii)	With a flow chart elaborate on the Kroll process of extraction of Titanium from its oxide ores	3	4	7
	OR			
13b (i)	Explain the electrolysis process of Magnesium Chloride	3	4	6
13b(ii)	Elaborate on alpha, alpha—Beta and Beta phase Ti alloys	3	4	7
14a (i)	List the ores of Nickel and explain how Nickel is extracted from its Sulfide ores	4	4	6
14a(ii)	Elaborate with necessary flow charts ,how Zinc is extracted through Hydro metallurgy route from its ores	4	4	7
	OR			
14b (i)	Prepare a report in Nickel Aluminides.	4	4	6
14b(ii)	Classify Ni alloys. Explain in detail the characteristics, compositions and usages of various Ni/ Cu alloys	4	4	7
15a (i)	Elaborate on the different process used for refining processed Lead ore	5	4	6
15a(ii)	With a block diagram examine the various steps involved in the extraction of Lead from its ore.	5	5	7
	OR			
15b (i)	Elaborate on the various types of Tin ore deposits	5	4	6
15b(ii)	Examine in detail the various steps involved in Tin ore mining and extraction	5	5	7
	PART C (1X15= 15 Marks. Q.No 16 is compulsory)			
16 (i)	Illustrate with a block diagram the Copper extraction process and explain in detail the various methods used to extract Copper from its ores.	1	4	10
(ii)	Sketch the phase diagram of Al Bronze and highlight the information one can infer from it.	3	5	5