

7/10/13

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**B.E. (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2013**

Materials Science and Engineering

Sixth Semester

14

**ML 9022 – PHYSICAL METALLURGY OF FERROUS AND ALUMINIUM ALLOYS**

(Regulation 2008 )

Time : 3 Hours

Answer ALL Questions

Max. Marks 100

**PART-A (10 x 2 = 20 Marks)**

1. State fick's first law
2. Interstitial diffusion is faster than vacancy diffusion- True or false? Justify your Answer
3. Define: activation energy
4. what is heterogeneous nucleation?
5. An important feature of plate martensite is the presence of micro cracks-True or False? Justify your answer
6. What are the two basic types of diffusionless transformation?
7. What types of alloys would respond to precipitation hardening?
8. What are the reasons for the formation of precipitate free zones?
9. What is secondary recrystallisation?
10. Distinguish between cold working and hot working.

**PART B (5x16=80)**

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|-----|------|--|------|
| 11  | (i)  | Explain the different kinetics and diffusion mechanisms  | (16) |
| 12a | (i)  | Derive the formula for the critical nucleus size during nucleation   | (6)  |
|     | (ii) | Derive the condition for the constitutional super cooling  | (10) |
| OR  |      |  |      |
| 12b | (i)  | Derive Johnson Mehl avrami equation  | (16) |
| 13a | (i)  | Explain the role of dislocations in martensite transformation  | (6)  |
|     | (ii) | Explain the martensite formation with Bain model   | (10) |
| OR  |      |  |      |
| 13b | (i)  | Explain the shape memory effect with an example  | (16) |
| 14a | (i)  | Explain the process of precipitation hardening in aluminium alloy and discuss the effect of time and temperature on microstructure changes | (16) |
| OR  |      |  |      |
| 14b | (i)  | What is G-P zones and explain the formation mechanism  | (16) |
| 15a | (i)  | Explain the grain growth law and discuss the five basic three dimensional geometrical process in grain growth                              | (10) |
|     | (ii) | Discuss the recovery mechanisms  | (6)  |
| OR  |      |  |      |
| 15b | (i)  | Explain the effect of time, temperature and strain on recrystallisation  | (16) |