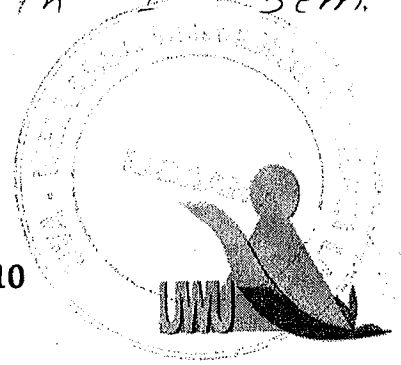


4th 1st Sem.



Uva Wellassa University, Sri Lanka
End Semester Examination – January 2010

CHE 456-2 Metallurgy

Time: Two (02) hours

Total 05 Questions

Answer four (04) questions only

1. Steel and cast iron are the most widely used materials in the world.
 - I. Explain the steel numbering system.
 - II. What are the differences between steel and cast iron?
 - III. Name four (4) metals that can be used for alloying steel and describe the properties that can be added to steel using each of these metals.
 - IV. Compare low carbon steel with high carbon steel.

2. Iron-carbon diagram plays a major role in ferrous metal industry specially to determine microstructures and associated behavior.
 - I. Draw a sketch of iron-carbon diagram between 0-2% carbon and annotate important areas of the diagram.
 - II. Describe ferrite, pearlite and cementite with the help of the iron-carbon diagram.
 - III. Compare the properties of austenite with pearlite.
 - IV. What characteristics are associated with small grain size? What characteristics are associated with large grain size?

(25 marks)

(25 marks)

3. Heat treatment of steel is very important to increase hardness, reduce hardness, stress relief and many other processes related to metal process industry.
- I. Explain the metal quenching procedure describing the four stages associated with quenching.
 - II. Name three quenching media and describe their applications.
 - III. Compare annealing and normalizing, and discuss the hardness, internal stresses and other associated properties.
 - IV. What is process annealing? What are the applications of process annealing?
- (25 marks)

4. Besides main heat treatment processes, tempering and surface hardening are also used in many occasions in the metal industry.
- I. What are the reasons to have tempering in metal industry? What are effects of tempering to the parent metal?
 - II. Compare two types of tempering processes using a sketch of an isothermal diagram.
 - III. Briefly discuss two types of surface hardening methods.
 - IV. A tiny gear used in a clock mechanism needs to be surface hardened. Which case hardening method would you recommend for this application? Why?
- (25 marks)

5. Aluminum, copper, zinc, titanium, platinum, silver and gold are some widely used non-ferrous metals in the metal industry.
- I. What is precipitation hardening? What are the uses of precipitation hardening?
 - II. Explain two methods that can be used to increase the hardness of aluminum.
 - III. Briefly discuss applications and strengthening of magnesium.
 - IV. Discuss applications of tin in electronic industry.
- (25 marks)