RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Applied Science
Third Year – Semester I/II Examination – October/November 2014

CHE 3202- METALLURGY AND ALLOYS

Answer **Only Four (4)** questions Time: Two hours

1. (a) Discuss the term "Chemical Metallurgy" in detail

[10 marks]

(b) Explain the term "Ore Deposit" and briefly explain the occurrence of elements

[10 marks]

(c) "It is generally necessary to concentrate the mined ore" explain the simple physical methods used to do so.

[05 marks]

2. (a) Out of the different methods of separating and extracting elements discuss the mechanical separation of the "elements that exists in the native form" and the "Thermal decomposition method".

[10 marks]

(b) Explain the Pig Iron production with the reactions involved in each stage in detail

[10 marks]

(c) What are the impurities present in pig iron, give the percentages of the relevant components.

[05 marks]

3. (a) What are Steels and why is C used as an alloying agent

[05 marks]

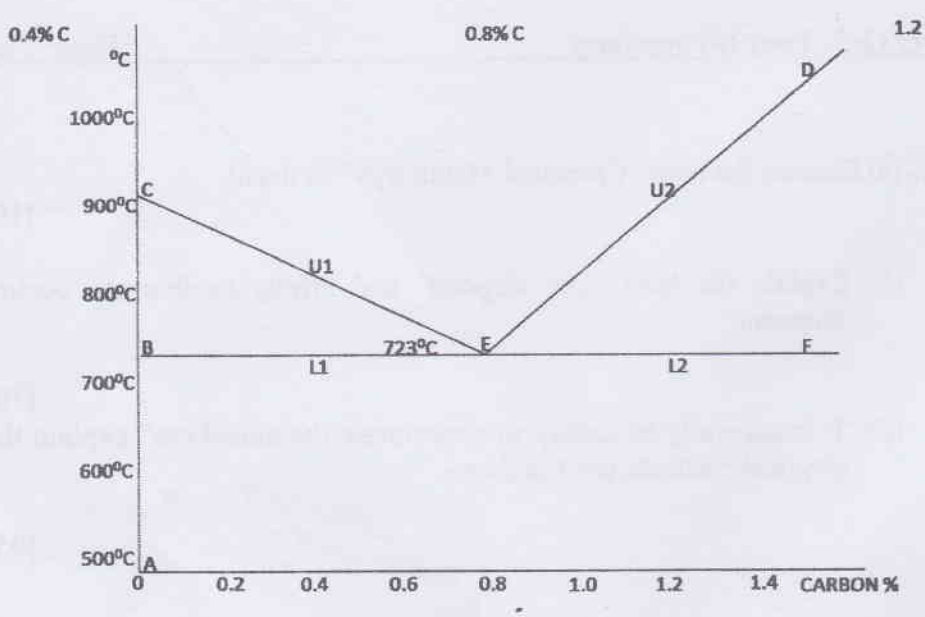
(b) Discuss the properties of steel

[05 marks]

(c) Explain the basic oxygen steel making process in detail and its advantages

[10 marks]

4. The below shown is the Iron-Carbon thermal equilibrium diagram



(a) Label the different regions in the diagram with the appropriate terms Austenite, Ferrite, Cementite and Pearlite. What are U1, U2, L1, L2, A, B, C, D, E and F.

[05 marks]

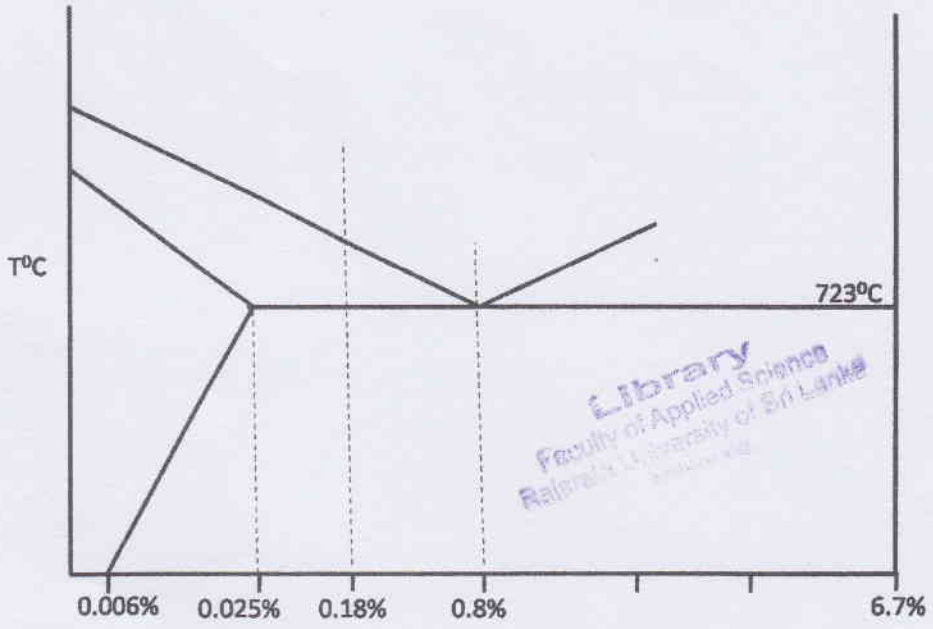
(b) Draw and explain the microstructures relevant to 0.4%, 0.8% and 1.2% C.

[10 marks]

(c) Discuss the relationship between Carbon content, microscopic structure and mechanical properties of plain Carbon steel in the normalized condition.

[10 marks]

5. Given below is the Fe-Fe_2C phase diagram



(a) Identify each phase present in the phase diagram

[05 marks]

(b) Using the Level rule, deduce the phases in the phases in the cast iron portion of the diagram at the composition line of 0.18% wt C at.

(i) 1650 ^{0}C
(ii) 1200 ^{0}C
(iii) 723 ^{0}C
(iv) Room Temperature

[10 marks]

(c) An eutectic steel (0.8% wt C) is heated to 800 ^{0}C and cooled down slowly through the eutectoid temperature. Calculate the number of grams of iron carbide formed per 100 g of steel in the above process.

[10 marks]