



UNIVERSITY OF RUHUNA

Faculty of Engineering

Mid-Semester 3 (Repeat) Examination in Engineering: June 2014

Module Number: ME3306

Module Name: Metallurgy for Engineers

[Two Hours]

[Answer all questions, each question carries five marks]

Q1 a) Briefly describe Mechanical Properties and Physical Properties of the engineering materials.

[1.5 Marks]

b) Depict how fatigue failure occurs in three stages with aid of suitable illustrations.

[1.5 Marks]

c) Discuss the factors that should consider for material selection and emphasize the necessity of testing of materials.

[2 Marks]

Q2. a) Compare Interstitial Solid Solution with Substitutional Solid Solution?

[1 Mark]

b) Draw a thermal equilibrium diagram representing the system between two metals, A and B, given the following data:

- A melts at 1100°C and B at 850°C
- A is soluble in B in the solid state to the extent of 10.0% at 700°C and 2.5% at 0°C
- B is soluble in A in the solid state to the extent of 20.0% at 700°C and 8.0% at 0°C
- An eutectic is formed at 700°C containing 40.0% A and 60.0% B.

[1.5 Marks]

c) Draw Iron-carbon equilibrium diagram and label all the phases. Also enumerate the properties of the following phases.

- α-Ferrite
- γ-Austenite
- Cementite

[2.5 Marks]

Q3. a) Why nickel and chromium are often added in conjunction to many low-alloy steels?

[1 Mark]

b) State the alloying elements that are used and explain the effects of those alloying elements to improve the properties of the following alloy steels.

i) High-strength Low-alloy (HSLA)

ii) Alloy Tool Steels

[2 Marks]

c) Discuss the statement 'carbon is the most important alloying element in steel'

[2 Marks]

Q4. a) Write brief descriptions of followings,

i) Cast Iron

ii) Stainless Steel

iii) Copper Alloys

iv) Aluminium Alloys

[2 Marks]

b) i. Sketch a named diagram of the Blast Furnace which produces pig iron.

ii. What are the reactions which can be taken place inside the furnace?

[3 Marks]