



# SLIATE

SRI LANKA INSTITUTE OF ADVANCED TECHNOLOGICAL EDUCATION

(Established in the Ministry of Higher Education, vide in Act No. 29 of 1995)

## Higher National Diploma in Engineering (Civil)

3<sup>rd</sup> year, Second Semester Examination – 2016

CE3120 - Materials Engineering

Instructions for Candidates:

Answer for four questions only

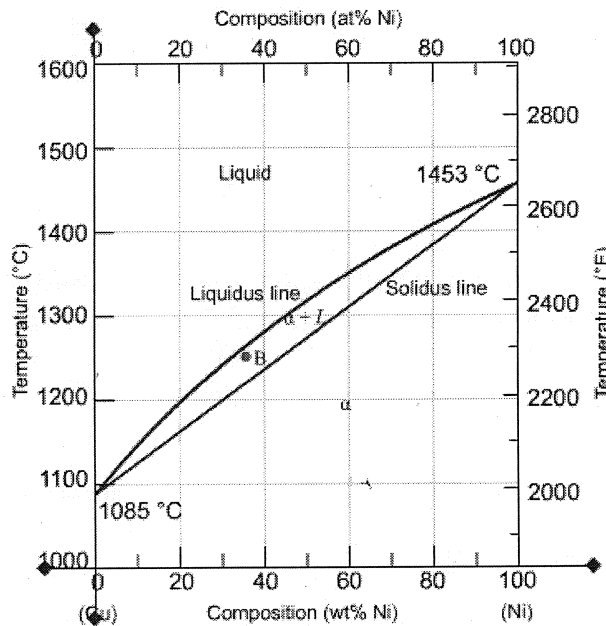
No. of questions : 05

No. of pages : 03

Time : 02 hours

Q1.

- a) Define the terms of crystal lattice and unit cell. (04 marks)
- b) Draw body centered cubic (bcc) and face centered cubic (fcc) unit cells and give two examples for each type. (06 marks)
- c) The Cu–Ni system shows complete solubility in both the solid and liquid phases. Phase diagram is shown below. Write the percentages of Cu and Ni in liquid and solid phases at point B.



- d) Write down one eutectic reaction that happen in the iron-carbon phase diagram and mention the carbon percentage and temperature at that point. (04 marks)
- e) Write down four phases of iron-carbon phase diagram and their unit cell type. (05 marks)

(Total 25 marks)

Q2.

- a) Define the following terms;
- i. Elasticity
  - ii. Plasticity
  - iii. Ductility
- (06 marks)
- b) Draw a Stress-strain curve showing following details in that graph.
- i. Yield point
  - ii. Elasticity limit
  - iii. Ultimate Tensile Strength
  - iv. Total plastic deformation
- (08 marks)
- c) What is the difference between the thermal expansion of crystalline and noncrystalline (amorphous) solids? (03 marks)
- d) Briefly describe the words conductors, semiconductors and insulators. (06 marks)
- e) What is the difference between Intrinsic Semiconductors and Extrinsic Semiconductors? (02 marks)

(Total 25 marks)

Q3.

- a) Define the words “Copolymers” and “Homopolymers” giving examples for each. (04 marks)
- b) Define the term Polymer Glass Transition Temperature and briefly explain the changing of polymer property at above and below the Polymer Glass Transition temperature (06 marks)
- c) Briefly describe the following.
- i. The procedure of making ceramic
  - ii. Four(04)nos. of ceramics properties
- (06 marks)
- d) State the two phases of composites using sketch. (04 marks)
- e) Define the term permanent hardness? Write down five salt types that are responsible for permanent hardness of water. (05 marks)

(Total 25 marks)

Q4. Admixtures are very popular for concreting in construction industry.

- a) Briefly explain the purpose of introducing admixtures to the concrete (05 marks)
- b) State five selection criteria for admixtures (05 marks)
- c) State five different types of admixtures and briefly explain two of them (10 marks)
- d) Briefly explain the way of storing the admixtures properly (05 marks)

(Total 25 marks)

Q5. Reinforcements are very important in the reinforced and prestressed concrete.

- a) Briefly explain the the function of the reinforcement in the concrete. (05 marks)
- b) Discuss the difference between high tensile steel and normal steel (05 marks)
- c) Briefly explain the protection of reinforcement in corrosion (05 marks)
- d) Mild steel is also introduced in the concrete. Explain the properties of mild steel and usage in the concrete (10 marks)

( Total 25 marks)