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/Mechanical/Building Services)

First Year, 2nd Semester Examination – 2016

ME 1207/BSE 1207- Properties of Engineering Materials

Instructions for Candidates:
Answer any **four** Questions **only**.
All Questions carry equal marks.

No. of questions : 05
No. of pages : 03
Time : 02 Hours

1)

a) Various materials with improved properties are required for the development of technology. Explain how these material requirements are fulfilled by today's industry. (05 Marks)

b) For industrial applications, ferrous metals are commonly used. Explain with reasons. (05 Marks)

c) Why ferrous metals are alloyed with other elements before using for industrial applications? Give examples for such applications. (05 Marks)

d) List down some common types of nonferrous metals and alloys used for industrial applications. Explain with reference to their compositions. (05 marks)

e) Classify three types of plastics used for engineering applications with reference to their properties. (05 Marks)

2)

a) Give examples for crystalline solids. Briefly explain the atomic arrangement in crystalline solids. (05 marks)

b) Briefly explain the face centered cubic (fcc) structure of metals. Give examples for metals with fcc structure. (05 marks)

c) Explain the following types of planner defects.

- Surfaces
- Grain boundaries (05 marks)

d) The presence of defects (imperfections) in metal structures leads to improve the strength of metals in many instances. Explain the reasons by giving examples. (05 marks)

e) What is cold working of metals? Explain how cold work supports to improve the strength of metals. (05 marks)

3)

a) Briefly explain the test method for measuring tensile strength of metals. Provide relevant illustrations. (05 Marks)

b) Define the term "Electrical resistivity". Suggest suitable materials to be used where electrical resistivity is highly important. (05 Marks)

c) A household equipment is made by joining two dissimilar materials and also subjected to moderate temperature variations. Identify and briefly explain important physical properties in selecting suitable material for above application. (05 Marks)

d) A metal part was fractured under a stress which was much lesser than its ultimate tensile strength. However it was found to be subjected to repeatedly fluctuating stresses before failure. Identify the type of failure. Explain the method of failure with relevant illustrations. (05 marks)

e) A machine part is frequently exposed to shock loads during operation. It is also likely to touch (or rub against) other metal parts very often. Explain what specific properties this machine part should possess for durable operation. (05 Marks)

4)

a) Draw the Iron Carbon phase diagram and clearly indicate the important regions. (05 Marks)

b) Explain microstructure of different steels with reference to their compositions and related sketches. (05 Marks)

c) Why heat treatment processes are applied to metal objects? Explain with examples. (05 Marks)

d) A steel machine part is required to have a soft and ductile core (inner part) and a surface that could withstand high scratches and wear. Identify a suitable heat treatment method and briefly explain the process.

(05 marks)

e) A ferrous metal work piece was found to be too hard to be machined by a milling cutter. Suggest a suitable heat treatment method to apply before machining the part. (05 Marks)

5)

a) Today's industrial applications prefer the use of polymers rather than metals in many instances. Discuss the reasons.

(05 Marks)

b) Explain the different types of additives used for polymers with reference to the purpose of each.

(05 Marks)

c) Explain how natural rubber can be made more rigid before using for industrial applications.

(05 Marks)

d) What are the different types of ceramics commonly used in industry? Discuss their practical applications.

(05 marks)

e) Briefly explain the different types of composites used in industry. (05 Marks)