



MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

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UNIVERSITY EXAMINATIONS 2023/2024

FIRST YEAR, SECOND SEMESTER, EXAMINATION FOR DIPLOMA IN MECHATRONIC TECHNICIAN LEVEL 6, MECHANICAL PLANT & MECHANICAL PRODUCTION TECHNICIAN LEVEL 6

ENG/OS/MC/CC/05/6/A: APPLY MATERIAL SCIENCE PRINCIPLES

DATE: APRIL 2024

TIME: 3 HOURS

INSTRUCTIONS: Answer Question ONE and any other Three questions.

QUESTION ONE (40 MARKS)

1. Explain the following properties of engineering materials. (4 Marks)
 - i. Creep
 - ii. fracture toughness
 - iii. Ductility
 - iv. Malleability
2. Giving examples distinguish between ferrous and non -ferrous metals (4 Marks)
3. Name three ferrous metals. (3 Marks)
4. List any four personal protective equipment necessary when handling engineering materials. (4 Marks)
5. Define heat treatment as used in engineering materials. (2 Marks)
6. According to OSHA regulations, what are some key safety practices that should be observed during heat treatment processes. (5 Marks)
7. Name any five engineering non-metallic materials. (5 Marks)



MUST is ISO 9001:2015 and



ISO/IEC 27001:2013 CERTIFIED

8. List 5 elements of an operation plan. (5 Marks)
9. a) Define the term crystal structure (1 Mark)
- b) state the crystal structures of metals commonly used in engineering applications. (4 Marks)
10. List 3 physical properties of engineering materials (3 Marks)

SECTION B (60 MARKS)

11. a) Discuss 6 mechanical properties of engineering materials. (12 Marks)
- b) Explain the criteria used when selecting suitable material to make components. (8 Marks)
12. a) State and describe 5 heat treatment processes. (10 Marks)
- b) Referring to your answer in (a) choose two heat treatment processes a give a detailed step to step guide of the procedures and their various applications. (10 Marks)
13. a) Discuss 6 methods of mitigating corrosion (10 Marks)
- b) Explain 4 common types of corrosion (10 Marks)
14. a) Discuss 5 material testing methods. (10 Marks)
- b) Explain various safety measures to be observed in material testing procedures. (10 Marks)

