



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS FOR THE DIPLOMA IN CIVIL ENGINEERING**  
**(TVET)**

**1<sup>ST</sup> YEAR 2<sup>ND</sup> SEMESTER 2023/2024 ACADEMIC YEAR**

**CENTRE: MAIN CAMPUS**

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**COURSE CODE: TDE 2124**

**COURSE TITLE: MATERIAL SCIENCE**

**EXAM VENUE: STREAM: Dip CIVIL ENGINEERING**

**DATE: ../04/2024 EXAM SESSION:**

**DURATION: 2 HOURS**

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**Instructions**

- 1. Answer ALL questions in Section A (Compulsory) and ANY other three questions in Section B**
- 2. Candidates are advised not to write on question paper**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**

## SECTION A (30 MARKS)

1. a) State three reasons for studying material science. (3 Marks)
- b) List two chemical properties of studying a material. (2 Marks)
- c) State three classifications of materials studied in material science. (3 Marks)
- d) Define nondestructive testing and list two examples. (3 Marks)
- e) State three safety measures to consider when handling construction materials. (3 Marks)
- f) State two common characteristics of bituminous materials. (2 Marks)
- g) List three factors affecting the strength of timber. (3 Marks)
- h) State and describe two types of preservation treatment for timber. (4 Marks)
- i) State four factors that need to be considered when choosing the materials for a construction job. (4 Marks)
- j) A soil sample has a porosity of 50% and specific gravity of 2.69. Calculate; if the soil sample is 50% saturated. (3 Marks)
  - i. Dry density
  - ii. Void ratio
  - iii. Bulk density

## SECTION B (40 MARKS)

2. a) State and describe four mechanical properties of materials. (8 Marks)
- b) A soil sample has a weight of 0.7kg and the volume was found to be  $3.5 \times 10^{-4} \text{ m}^3$ . After drying out the weight was reduced to 0.6kg. The particle specific test gave 2.6. Determine the following; (12 Marks)
  - i. Moisture content
  - ii. Dry density
  - iii. Bulk density

- iv. Void ratio
- v. Porosity
- vi. Degree of saturation

3. a) Define destructive and non-destructive test. (2 Marks)
- b) State and briefly describe two of each of the test. (8 Marks)
- c) In a table form, state three differences of the destructive and non-destructive test. (6mks)
- d) List four industries that rely on non-destructive test. (4 Marks)
4. a) State two classes of bituminous material. (2 Marks)
- b) List three types of bituminous material used in pavement construction. (3 Marks)
- c) List and describe three tests that are carried out on asphalt and bituminous materials. (12 Marks)
- d) State three limitations of the usage of tar in highway construction. (3 Marks)
5. a) Discuss five factors to consider when ensuring quality in construction material selection. (10 Marks)
- b) Describe the manufacturing process of bricks. (10 Marks)