



MACHAKOS UNIVERSITY

University Examinations for 2020/2021

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FIRST YEAR SECOND TERM EXAMINATION FOR

DIPLOMA IN BUILDING TECHNOLOGY

DIPLOMA IN BUILDING CIVIL ENGINEERING

STRUCTURES 1

DATE: 8/9/2021

TIME: 11:30 – 2:30 PM

INSTRUCTIONS:

ANSWER ALL QUESTIONS

1.
 - a) Differentiate between long column and a short column (4 marks)
 - b) Give six Euler's assumptions for long columns. (12 marks)
 - c) Give four end conditions in columns (4 marks)
2. A simply supported beam with an overhang carries a uniformly distributed load of 2KN/M as shown in the **figure 1**
 - i) Determine reactions at supports
 - ii) Draw the shear force and bending moment diagram
 - iii) Determine the point of contra flexure
 - iv) Determine the maximum bending moment (20 marks)
3. A cantilever beam of span 6metres carries a uniformly varying load of 10KN/M and a point load of 15KN as shown in **figure 2**
 - (i) Determine reactions at supports
 - (ii) Draw the shear force and bending moment diagram (20 marks)
4.
 - a) Define the following terms
 - (i) Crippling load
 - (ii) Crushing load
 - (iii) Slenderness ratio (6 marks)

- b) Deduce an expression for crippling load when both ends of a column are hinged. (14 marks)
5. a) A hollow cast iron column of 200mm outside diameter and 150mm inside diameter, 8 metres long has both of the ends fixed. It is subjected to an axial compressive load. Taking factor of safety as 6, determine the safe Rankine's buckling load. (10 marks)
- b) With the aid of a diagram, describe failure of a long column (10 marks)



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GEOTECHNOLOGY 1

DATE: 10/9/2021

TIME: 8:30 – 11:30 AM

INSTRUCTIONS:

ANSWER ALL QUESTIONS

1. a) Define the following terms
 - (i) Disturbed sample
 - (ii) Undisturbed sample
 - (iii) Representative sample
 - (iv) Non representative sample

(8 marks)
- b) Explain the three types of sedimentary rocks

(6 marks)
- c) Illustrate three tools used in soil sampling

(6 marks)
2. a) Describe seven properties of a mineral

(14 marks)
- b) Differentiate between petrology and mineralogy.

(6 marks)
3. a) Explain the four characteristics of orthoclase mineral

(12 marks)
- b) Explain four reasons why undisturbed sample is hard to obtain at a site

(8 marks)
4. a) Discuss six properties of igneous rocks

(12 marks)
- b) Describe the four characteristics of talc mineral

(8 marks)
5. a) Outline six reasons for site investigation

(12 marks)
- b) Outline with a diagram the rock cycle

(8 marks)

4. a) illustrate seven symbols used in chain surveying (7 marks)
- b) With the aid of a diagram, explain how to chain through a river as the obstacle (13 marks)
5. a) With the aid of a diagram, describe reciprocal ranging. (6 marks)
- b) Illustrate a survey site showing 10 physical features, baseline, check lines, proofs lines with well-conditioned triangles. (14 marks)



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CONSTRUCTION MATERIALS 1

DATE: 7/9/2021

TIME: 2:30 – 5:30 PM

INSTRUCTIONS:

ANSWER ALL QUESTIONS

1.
 - a) Differentiate between ferrous metals and non-ferrous metals giving two examples of each (8 marks)
 - b) Give the alloy and two uses of the following metals
 - (i) Aluminum
 - (ii) Copper
 - (iii) Zinc
 - (iv) Lead(12 marks)
2.
 - a) Give three properties of each of the following building materials.
 - (i) Adhesives
 - (ii) Asbestos
 - (iii) Thermo Cole(9 marks)
 - b) Give five uses of rubber (5 marks)
 - c) Give six uses of plastics (6 marks)
3.
 - a) Give ten properties of plastics (10 marks)
 - b) Give five properties of a good paint (5 marks)
 - c) Give five properties of a good varnish. (5 marks)

4.
 - a) Explain six types of varnish (12 marks)
 - b) State four properties of steel (4 marks)
 - c) List four uses of glass (4 marks)
5.
 - a) Explain the following treatment done to metals
 - (i) Hardening
 - (ii) Tempering
 - (iii) Annealing
 - (iv) Normalizing (10 marks)
 - b) Give six properties of glass (6 marks)
 - c) Describe the following
 - (i) Glass wool
 - (ii) Gas glass (4 marks)



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GEOTECHNOLOGY 2

DATE: 8/9/2021

TIME: 8:30 – 11:30 AM

INSTRUCTIONS:

ANSWER ALL QUESTIONS

1. a) Define the following terms as they apply to dams.
 - (i) Full reservoir level Reservoir
 - (ii) Yield from a reservoir
 - (iii) Tail water
 - (iv) Dead storage
 - (v) Useful storage

(10 marks)
- b) With the aid of a diagram, describe the following dam types
 - (i) Gravity dam
 - (ii) Buttress dam
 - (iii) Rock embankment dam

(10 marks)
2. a) Explain the six factors affecting the selection of a dam site

(12 marks)
- b) Outline four factors affecting the selection of a reservoir site

(8 marks)
3. a) Explain six factors affecting the selection of a dam type

(12marks)
- b) Explain four factors affecting mechanical weathering process

(8 marks)
4. a) Explain six factors affecting chemical weathering process.

(12 marks)
- b) With a well labeled diagram, describe two types' faults

(8 marks)

5. a) With the aid of a diagram, describe the heading and benching method of tunnel construction (12marks)
- b) Describe three elements used in faults recognition (8 marks)



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SURVEYING 2

DATE: 10/9/2021

TIME: 8:30 – 11:30 AM

INSTRUCTIONS:

ANSWER ALL QUESTIONS

1. a) Describe the followings terms as applied to theodolite
 - (i) Swinging
 - (ii) Transiting
 - (iii) Face left observation
 - (iv) Face right observation
 - (v) Trunnion axis(10 marks)
- b) With the aid of a diagram, describe the three types of vertical curves (10 marks)
2. With the aid of a diagram, outline four types of horizontal curves (20 marks)
3. a) Give two obstacles in curve ranging (2 marks)
- b) With the aid of a diagram, outline all the elements of a simple circular curve (18 marks)
3. a) Define the following terms as applied in curve ranging
 - (i) Length of curve
 - (ii) Tangent length
 - (iii) Point of tangent
 - (iv) External distance
 - (v) Long chord
 - (vi) Point of curve
 - (vii) Sub chord(14 marks)

- b) Give three reasons for curve ranging. (6 marks)
5. A circular curve has a 20metres radius and a 65° deflection angle. Determine the following:
- (i) Degree of curve
 - (ii) Length of curve
 - (iii) Tangent length
 - (iv) Length of long chord
 - (v) Apex distance
 - (vi) Mid-ordinate
- (20 marks)



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MEASUREMENT

DATE: 1/9/2021

TIME: 8:30 – 11:30 AM

INSTRUCTIONS:

ANSWER ALL QUESTIONS

1. Take off all quantities for the substructural works shown to Drawing No. 01 (30marks)
2.
 - a) Define the following terms
 - i) Contingency sum
 - ii) Deemed to included items
 - iii) Provisional sum
 - iv) Extra over items
 - v) Spot items (12 marks)
 - vi) Preliminaries
 - b) Give three examples of deemed to be included items . (8 marks)
3.
 - a) Explain the process involved in the preparation of bill of quantities using the traditional method (14 marks)
 - b) Give two functions of a quantity surveyor during
 - (i) Pre-construction stage
 - (ii) Construction stage (6 marks)

4. a) Give six purposes of a bill of quantity (12 marks)
- b) List six conditions under which contract can be terminated (6 marks)
- c) Define the following terms
- (i) Preambles
 - (ii) Prime cost sum (2 marks)
5. a) List six conditions under which contract can be extended (6 marks)
- b) Illustrate the following as used in measurement using a suitable example.
- (i) Timesing
 - (ii) Grouping of Descriptions
 - (iii) Bracketing
 - (iv) Dotting-On (8 marks)
- c) Briefly explain the following types of bill of quantities
- (i) Traditional bill
 - (ii) Elemental bill
 - (iii) Operational bill (6 marks)

- b) Give six roles of a subcontractor (6 marks)
- c) Give two roles of a supplier (2 marks)
- 6. a) Give six causes of adjustment to the contract sum (12 marks)
- b) Give four causes of variations in construction (8 marks)



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CERTIFICATE IN BUILDING TECHNOLOGY

CONSTRUCTION MATERIALS 1

DATE: 9/9/2021

TIME: 11:30 – 2:30 PM

INSTRUCTIONS

ANSWER ALL QUESTIONS

1. a) Differentiate between ferrous metals and non- ferrous metals giving two examples of each (8 marks)
- b) Explain the six classifications of concrete (12 marks)
2. a) Describe seven stages involved during production of concrete (14 marks)
- b) State three types of concrete and give mix proportion of each (6 marks)
3. a) Describe six factors affecting the workability of concrete (12 marks)
- b) Define the water cement ratio (2 marks)
- c) Give six properties of a good concrete (6 marks)
4. a) State three types of non-ferrous metals and give three uses of each (12 marks)
- b) Give four properties of glass (8 marks)
5. a) State three types of ferrous metals and give three properties of each (12 marks)
- b) State the alloy of Copper giving its three properties and its three uses (8 marks)



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WATER SUPPLY

DATE: 30/8/2021

TIME: 2:30 – 5:30 PM

INSTRUCTIONS

ANSWER ALL QUESTIONS

1. a) Give ten comparisons between a centrifugal pump and a reciprocating pump
(20 marks)
2. a) Will the aid of diagram, describe the pelton wheel in turbines. (8 marks)
b) A gate 3m wide and 2m deep is fitted in a wall having a slope of 60° constructed across a channel. Determine;
 - i) Total pressure
 - ii) Position of the gate when the channel is full of water (10 marks)
- c) State the Archimedes principle (2 marks)
3. a) Derive an expression to show that Centre of pressure equals to;
(10 marks)
$$H = IG/\bar{A}X + \bar{X}^2$$
 - b) A rectangular plate 2M wide and 4M deep is immersed in water in such a way that its plane makes an angle of 25° with the water surface as shown in **Figure 1**. Determine:
 - i) Total pressure on one side of the plate

- ii) The position of Centre of gravity (10 marks)
4. a) Explain three conditions of equilibrium of a floating body (6 marks)
- b) Define the following types of flow
- i) Streamline flow
 - ii) Turbulent flow
 - iii) Steady flow
 - iv) Unsteady flow
 - v) Compressive flow
 - vi) Rotational flow
 - vii) Irrotational flow (14 marks)
5. a) Give two applications of hydrostatics (2 marks)
- b) Explain with a neat diagram the working of hydraulic ram and define its efficiency (10 marks)
- c) Describe with a diagram the working principle of a reaction turbine (8 marks)

