



MACHAKOS UNIVERSITY

University Examination 2018/2019

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN CIVIL ENGINEERING

BCECD 315: HYDRAULICS

DATE: 31/7/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS: Answer questions **ONE** and any other **TWO** questions.

1. a) Give two differences between pelton wheel turbine and the reaction turbine (10 marks)

- b) For uniform flow through open channels, derive an expression that show that $Q = A C V_m$ (10 marks)
- c) With the aid of a diagram, describe the following pumps
 - i. Reciprocating pump
 - ii. Centrifugal pump (10 marks)
2. a) Give five differences between impulse turbine and reaction turbine (10 marks)
- b) Water is flowing at a rate of $16.5 \text{ m}^3/\text{s}$ in a earthen trapezoidal channel with bed of width 9m, water depth 1.2m and side slope 1:2. Calculate the bed slope, if the value of C in the Chezy's formula be 49.5 (10 marks)
3. a) A rectangular channel has a cross section of 8 m^2 . Find its size and discharging through the most economical section, if the bed slope is 1 in 1000. Take $C=55$ (15 marks)
- b) With the aid of a diagram, describe the pelton wheel turbine (5 marks)

4. a) with the aid of a diagram, describe the following reaction turbine types
- i. Inward flow reaction turbine
- ii. Outward flow reaction turbine (6 marks)
- b) A channel has two sides vertical and semi-circular bottom of 2 metres diameter. Calculate the discharge of water through the channel, the depth of flow is 2 metres. Take $C=70$, and slope of bed as 1 in 100. (10 marks)
- c) Give two advantages of air lift pump (4 marks)
5. a) With the aid of a diagram, describe the working of hydraulic ram and define its efficiency (16 marks)
- b) Give the main components of a pelton wheel turbine (4 marks)



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BCECD : SOIL MECHANICS 1

DATE:

TIME:

INSTRUCTIONS: Answer questions **ONE** and any other **TWO** questions.

1. a) with the aid of a diagram explain the three types of clay mineral structures
(6 marks)

 b) Explain the following soil properties
 - i. Void ratio
 - ii. Porosity
 - iii. Specific gravity
 - iv. Moisture content
 - v. Unit weight
 - vi. Degree of saturation
 - vii. Bulk density (14 marks)
 - c) Give three factors that affect soil compaction (6 marks)
 - d) Explain the following attenberg limits
 - i. Plastic limit
 - ii. Liquid limit (4 marks)
2. a) Prove the following soil relationships (4 marks)

$$S = \frac{W}{G_s}$$

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- b) The mass of a wet sample of soil and its container is 0.33kg. The dry mass of soil and its container is 0.29kg. The mass of the container is 0.06 and its volume is $0.15 \times 10^{-3} \text{m}^3$. Determine the following:-
- The bulk, dry and saturated unit weight of the soil.
 - The void ratio and degree saturation
 - How much air voids is in the field
 - The weight of water required to saturate 1m^3 of the soil (16 marks)
3. a) Describe with an aid of a diagram the three types of crystalline clay minerals (6 marks)
- b) Describe how soil classification is done on the particle size distribution (14 marks)
4. a) Describe the soil identification in the field (14 marks)
- b) Give two reasons for soil classification (4 marks)
- c) Name two systems used in soil classification (2 marks)
5. In its natural condition a soil sample has a mass of 2290g and a volume of $1.15 \times 10^{-3} \text{m}^3$. After being completely dried in an oven the mass of the sample is 2035g, the value of G_s for the soil is 2.68. Determine
- Bulk density
 - Unit weight
 - Water content
 - Void ratio
 - Porosity
 - Degree of saturation
 - Air content (20 marks)



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BCECD 214: SURVEYING III

DATE: 30/7/2019

TIME: 8.30-10.30 AM

INSTRUCTIONS: Answer questions **ONE** and any other **TWO** questions.

1. a) With the aid of a diagram, show all the elements of a simple circular curve
(10 marks)
- b) With the aid of a diagram, describe any three types of horizontal curves
(6 marks)
- c) A tract of land has three straight boundaries AB, BC and CD. The fourth boundary DA is irregular. The measured lengths are under: AB=135m, BC=191m, CD=126m, BD=225m. The offsets measured outside the boundary DA to the irregular boundary at a regular interval of 30m from, are as below

Distance from D(M)	0.0	30	60	90	120	150	180
Sets (m)	0.0	3.7	4.9	4.2	2.8	3.6	6.0

Determine the area of the tract (14 marks)

2. The chainage of intersection point of two straights is 1060m and the angle of intersection is 120° . If radius of a circular curve to be set out is 570m, the peg interval is 30m, determine.
- The tangent length
 - Length of the curve
 - The chainage at the beginning and the end of the curve

Examination Irregularity is punishable by expulsion

- iv. The length of the long chord
- v. The length of the sub-chord
- vi. Total number of chords (20 marks)

3. A circular curve of 250m radius is to be set out between two straight having deflection angle of $45^{\circ}20'$ right, and the chainage of the point of intersection as 112m. Calculate the necessary data for setting out the curve by the method of offsets from the chord produced taking the length of one chain as 20m (20 marks)

4. The following data was taken while measuring an irregular boundary

Distance from D(m)	0.0	30	60	90	120	150	180
Offsets	00	3.7	4.9	4.2	2.8	3.6	6.0

- a) Calculate the area using:-
 - i. Trapezoidal rule
 - ii. Simpson's rule
 - b) Calculate the volume using:-
 - i. End – areas rule
 - ii. Prismoidal rule (20 marks)
5. a) With the aid of a diagram, describe five types of horizontal curves (15 marks)
- b) With the aid of a diagram, explain the following
- i. Cut
 - ii. Fill
 - iii. Cut and fill (5 marks)



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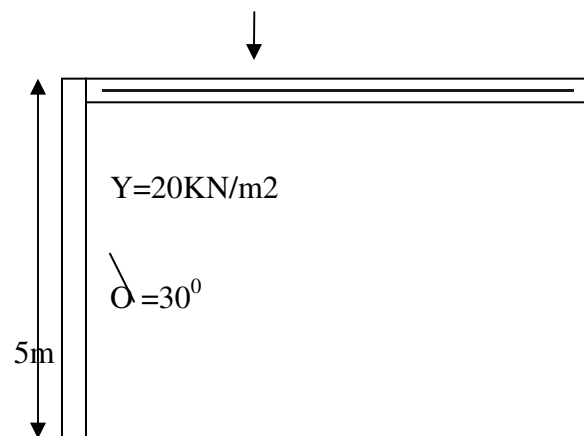
BCECD.....: FOUNDATION ENGINEERING

DATE:

TIME:

INSTRUCTIONS: Answer questions **ONE** and any other **TWO** questions.

1. a) Give the three types of earth pressures (3 marks)
- b) Determine the active earth pressure on the frictionless wall shown. Calculate the resultant force and its location from the base of the wall. Neglect seepage effects (10 marks)



- c) A vertical retaining wall 6.1m high supports a cohesionless fill that weighs 18.4KN/m^3 . The upper surface of the fill rises above the crest of the wall at an angle of 20° with the horizontal. The angle of internal friction is 28° , and the angle of wall friction is 20° . By the coulomb's method compute the total active earth pressure against the wall. (10 marks)
- d) Describe two types of settlement of foundation (4 marks)
- e) Give three methods used in the determination of ultimate bearing capacity (3 marks)
2. a) Give five assumptions of lateral earth pressure (10 marks)
- b) Calculate the bearing capacity per unit of area of a continuous footing 2.44m wide, supported on a soil which $C=20$ and $O=170$ and $Y=19\text{KN/m}^2$. The load settlement curve resembles C, in Fig. 2. The depth of the foundation is 2m. The water table is at a depth of 5m below the ground surface (10 marks)
3. a) with the aid of diagrams, describe the following earth pressures
- Lateral earth pressure
 - Active earth pressure
 - Passive earth pressure (15 marks)
- b) Give five types of retaining walls (5 marks)
4. a) with the aid of a diagram, show the following mohr's circles for:-
- At rest earth pressure
 - Active earth pressure
 - Passive earth pressure (10 marks)
- b) With the aid of a diagram, illustrate the variation of active, passive and lateral earth pressure with depth (10 marks)
5. A point load of 24KN acts on the earth surface of elastic mass of very great extent. What is the intensity of vertical pressure, due to the load, at a depth of 1m directly below load, at a depth of 2m, at a depth of 5m? What is the intensity of the vertical pressure at the same depths of a horizontal distance of 1m from the line of action of the point load (20 marks)