



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2020/2021
FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
CONSTRUCTION MANAGEMENT

BCM 203: GEOLOGY AND HYDROLOGY FOR CONSTRUCTION

DATE: MONDAY 29TH MARCH 2021

TIME: 2.00 P.M - 4.00 P.M

INSTRUCTIONS:

Answer question ONE in Section 1 and any other TWO from Section 2.

SECTION 1 (30 Marks)

Question 1

(a) Differentiate between the following terms:

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|------|--|-----------|
| i) | Rock <i>and</i> Mineral | [4 marks] |
| ii) | Tectonism <i>and</i> Denudation | [4 marks] |
| iii) | Porosity <i>and</i> Permeability | [4 marks] |
| iv) | Potential <i>and</i> Actual Evapotranspiration | [4 marks] |

(b) Give a description of the rock cycle and state, with reasons, the preferred rock type for construction works. [8 marks]

(c) With the aid of a sketch, explain the hydrological cycle [6 marks]

SECTION 2 (40 Marks)

Question 2

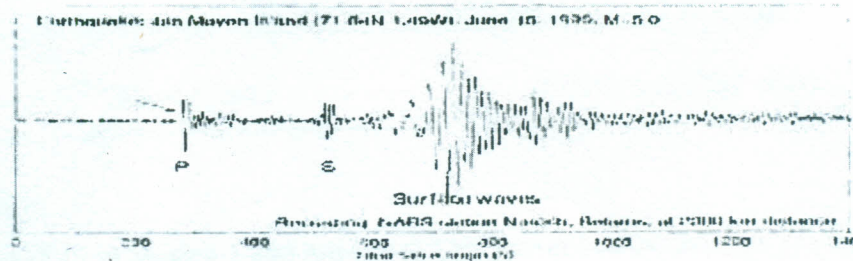
(a) Using the theory of plate tectonics, describe the formation of a rift valley and the associated fault type [10 marks]

(b) (i) Apply the concept of forces acting on a slope to explain how landslides occur [5 marks]

(ii) Determine the factor of safety for a rectangular block of rock having a density of 2.90 g/cm^3 and volume of 330 m^3 on a slope inclined at 16° . State whether the block is stable or not and explain why [5 marks]

Question 3

- (a) Explain TWO natural causes of earthquakes and differentiate between earthquake magnitude and earthquake intensity [10 marks]
- (c) Derive an equation for the epi-central distance from a recording station. [4 marks]
Use the figure below to determine:
- (i) The epi-central distance, if P and S velocities are 6.0 and 3.5 km/s respectively. [3 marks]
- (ii) The amount of energy released by the earthquake [3 marks]



Question 4

- (a) Using a sketch, give a description of the classification of sub-surface water after infiltration indicating the flow directions in the different zones [10 marks]
- (b) (i) Explain the Darcy Law [6 marks]
- (ii) What is the annual discharge from a pond, if the permeability of the embankment soil is 1×10^{-6} cm/s under a hydraulic gradient of 0.01 over an area of 10m^2 ? [4 marks]

Question 5

- (a) Explain the water balance and discuss the impacts of urban development on the water balance in a catchment [8 marks]
- (b) A water catchment has an area of $3,000\text{ km}^2$. It receives an annual precipitation of 1,500 mm. The average flow rate measured in a river draining the catchment is $20\text{m}^3/\text{s}$.
- i) What is the total annual river run-off?
- ii) What is the runoff coefficient of the catchment?
- iii) How much water is lost due to the combined effects of evaporation, transpiration, and infiltration expressed in mm? [12 marks]