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**JOMO KENYATTA UNIVERSITY**

**OF**

**AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2014/2015**

**FIRST YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE IN CONSTRUCTION ENGINEERING AND MANAGEMENT**

**ECE 3169: MARINE STRUCTURES**

**DATE: AUGUST 2015 TIME: 3 HOURS**

**INSTRUCTIONS: ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS.**

**QUESTION ONE - (COMPULSORY 30 MARKS)**

A caisson type of upright breakwater of cross-section size 11.0m

wide by 16.0m high is to be constructed on a rubble base of

thickness 4.5 m. Given the following conditions below, determine

the following:

1. The wave pressure and uplift force on the breakwater using

the simplified Sainfluo formula [18 marks]

1. The stability of the breakwater against:
2. Sliding
3. Overturning

[12 marks]

Design conditions:

Design wave height 4.0 m

Design wave length 38.0 m

Depth of water to sea bottom 14.5 m

Unit weight of water 10.0 KN/m3

Unit weight of caisson 17.0 KN/m3

Co-efficient of friction 0.6

**QUESTION TWO (25 MARKS)**

1. i) Outline the factors that determine the width of approach

 channels.

ii) Illustrate the width components of a two way channel

 using a suitable sketch.

 [12 marks]

1. Describe the components of depth at a harbor using an

illustration. [7 marks]

1. Sketch a typical plan of a small artificial harbor and indicate

the minimum dimensions. [6 marks]

**QUESTION THREE (25 MARKS)**

1. Outline the causes of deterioration of marine structures. [11 marks]
2. Describe the SIX zones of marine structure deterioration. [14 marks]

**QUESTION FOUR (25 MARKS)**

1. Discuss briefly the factors that determine the choice between

open and solid type design of mooring structures. [7 marks]

1. Sketch and label the following mooring structures:
2. Block wall Quay
3. Sheet pile wall Quay
4. Caisson Quay

[18 marks]

**QUESTION FIVE (25 MARKS)**

1. State Nagai’s formula for the design of vertical sea walls

subjected to deep water waves and give the assumptions

on which the formula is based. [7 marks]

1. Outline the matters to be considered for the design of

breakwaters. [6 marks]

1. Sketch and label the following types of breakwaters:
2. Rubble sloping breakwater
3. Caisson upright breakwater

[12 marks]