THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE CIVIL ENGINEERING

(BSCE YV, SII)

ECE 2510: HARBOUR ENGINEERING

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2012

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consists of **FIVE** questions.

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **TWO** printed pages

Question One (Compulsory)

a) Outline the sequence to be followed in the design of breakwaters. **(10 marks)**

b) (i) State the simplified Sainfluo's formulae for the determination of wave pressure on an upright breakwater.

(ii) Sketch the typical pressure diagram that illustrates the above formulae. **(10 marks)**

c) Describe briefly the assumptions for use of Nagai's formula for the design of sea walls. **(5 marks)**

d) Define the wave heights measured at a harbour for purposes of design of harbour structures. **(5 marks)**

Question Two

a) Sketch and label the following types of breakwater:
- **(i)** Rubble sloping breakwater
- **(ii)** Concrete block upright breakwater
- **(iii)** Caisson type upright breakwater **(18 marks)**

b) Describe the procedure of construction of the caisson type upright breakwater. **(2 marks)**

Question Three

a) Illustrate the components of depth at a harbour that should be allowed for when designing the underked clearance. **(6 marks)**

b) Sketch and label a typical layout of a small artificial harbour. **(6 marks)**

c) (i) Using a suitable sketch, illustrate the width dimensions of a two lane channel.

(ii) State any **FOUR** factors that determine channel width. **(8 marks)**

Question Four

a) Describe the following berth structure using suitable sketches;
- (i) Block wall quay
- (ii) Simple sheet pile wall quay **(10 marks)**

b) State the advantages of sheet pile cell quays over other quays. **(3 marks)**

c) (i) Outline the factors that affect the choice between solid or open type of berth construction.

(ii) State any **FOUR** types of materials used for open type construction. **(7 marks)**

Question Five

a) Describe briefly the main types of harbour. **(6 marks)**

b) State the factors that determine the following:
- (i) Decision to build a harbour
- (ii) Choice of location of harbour **(6 marks)**

c) Define the following terms used in harbour design:
- (i) Displacement Tonnage
- (ii) Dead Weight Tonnage **(3 marks)**

d) Sketch the following types of dredgers:
- (i) Bucket Dredger
- (ii) Grab Hopper Dredger **(5 marks)**