TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR BACHELOR OF SCIENCE IN CIVIL ENGINEERING
[Institutional Based Programmes]

ECE 2510: HARBOUR ENGINEERING

END OF SEMESTER EXAMINATION
SERIES: AUGUST 2013
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*
- *Pocket Calculator*

This paper consists of **FIVE** questions.
Answer question **ONE** 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) Describe the mean type of harbours giving ONE example of each. **(8 marks)**

b) Outline the factors that determine the following:
(i) The decision to build a harbor
(ii) The choice of the location of a harbor **(9marks)**

c) Define the following ship characteristics used in the design of harbours.
- **(i)** Displacement Tonnage
- **(ii)** Dead weight Tonnage **(3 marks)**

Question Two

a) State the assumptions on which Nagai's formula for the design of vertical sea walls is passed. **(5 marks)**

b) Outline the procedure for the design of breakwaters. **(5 marks)**

c) Sketch and label any type of the following harbor structures:
- **(i)** Sloping breakwater
- **(ii)** Upright breakwater **(10 marks)**

Question Three

a) State the factors that influence the width of a harbour's approach channel **(4 marks)**

b) Sketch a section through a single lane channel to illustrate the typical width dimensions. **(4 marks)**

c) Using a suitable sketch, illustrate the depth components of a harbor **(6 marks)**

d) Sketch a typical layout of a small artificial harbor **(6 marks)**

Question Four

a) With the aid of a sketch, define the following characteristics of a deep-sea wave form:
- **(i)** Wavelength
- **(ii)** Still water depth
- **(iii)** Wave velocity
- **(iv)** Wave period

b) Define the important wave lengths that should be recorded in a harbor for use in design of harbor structures.

c) State the Hiroi's Formula for the design of breakwaters and give the conditions for its use.

Question Five

a) Outline he causes of deterioration of harbor structures. **(9 marks)**

b) Using a sketch, illustrate the main zones of marine deterioration **(5 marks)**

c) Sketch the following types of dredgers:
- **(i)** Self-propelled bucket dredger
- **(ii)** Self-propelled grab hopper dredger **(6 marks)**