TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of Mechanical & Automotive Engineering
UNIVERSITY EXAMINATION FOR:
Diploma in Marine Engineering (Y2S1)
EMR 2222 : Ship Stability I
SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: SEPTEMBER 2018
TIME: 2 HOURS
DATE: Sep 2018

Instruction to Candidates:

You should have the following for this examination

- *Examination Pass & Student ID Card*
- *Answer booklet*
- *Non-Programmable scientific calculator*

This paper consists of **FIVE** questions. Attempt any **THREE** questions.
Maximum marks for each part of a question are as shown.
Do not write on the question paper.

Question ONE

a) What do you understand by the term Centre of buoyancy? (**5 marks)**

b) A ship's underwater volume is divided into the following vertical cross-sections, from forward to aft, spaced 20 meters apart: 10; 91; 164; 228; 265; 292; 273; 240; 185; 111; 67 square metres. If the same underwater volume is divided into water planes, 2 metres apart, their areas, from the keel upwards are: 300; 2704; 3110; 3388; 3597; 3759; 3872 square meters. Find the position of the centre of buoyancy; **(15 marks)**

i. Fore and aft, relative to the mid-ordinate.
ii. Vertically, above the keel.

Question TWO

a) What is the effect of density on a ship draft? **(5 marks)**

b) What do you understand by the term "Fresh Water Allowance" (FWA)? **(5 marks)**

c) A ship floats at a draft of 6.83 m in water of density 1.022 t per cubic metres. What would be her draft in water of density 1.010 t per cubic metres, if her fresh water allowance is 156 mm? **(10 marks)**

Question THREE

a) Discuss the term "Tonnes per Centimeter Immersion (T.P.C.) (**8marks**)

b) A ship is 120m long and 18m beam and the coefficient of fineness of her water plane is 0.788, find her T.P.C. in salt water. (Take density of S.W. as 1.025 t/m^3) (**12marks)**

Question FOUR

a) Define the word "Trim". **(5 marks)**

b) The summer waterplane of a ship is defined by a series of half ordinates at 4.1m separation as follows:

Station	1	2	3	4	5	6	7	8	9	10	11
Half Ordinate	0.10	5.20	9.84	12.80	14.04	14.40	14.20	13.70	12.60	10.06	1.30

Calculate the area of the waterplane, the position of its centroid of area and its second moment of area. **(15 marks)**

Question FIVE

a) What do you understand by the term "Damaged Stability" and how is its effect countered in ship construction. **(5 marks)**

b) A vessel of constant rectangular cross section is 60 m long and 10 m wide floats at a level keel draught of 3 m and has a center of gravity 2.5 m above the keel. Using the added weight method, determine the fore and aft draughts if an empty full width fore- end compartment 8 m long is opened to the sea. (For simplicity, a permeability of 100 % is assumed). **(15 marks)**