TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION 2013/2014

SECOND YEAR FIRST SEMESTER UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMG 2203 : ENGINEERING MECHANICS-STATICS

TIME: 2 HOURS **SERIES:** DECEMBER, 2013

INSTRUCTIONS TO CANDIDATES

1. You are required to have the following for these examinations:
   - Drawing Instruments
   - Scientific Calculator
2. This paper has **FIVE** Questions.
3. Answer **ANY THREE** Questions.
4. All Questions carry **EQUAL** marks.
5. This paper consists of **THREE** ***Printed pages.***

Q.1 A roof truss is loaded as shown in Figure Q.1. Using method of sections determines the force in members:

(i) DF
(ii) DG
(iii) EG

(20 marks)

Q.2 The cross-section of a concrete dam is shown in Figure Q2. The densities of water and concrete are 10^3kg/m and 2.4 x 10^3kg/m^3 respectively. for a section 0.3m wide determine:

(a) The resultant of the reaction forces exerted by the ground on the base AB of the dam.
(b) The point of application of the resultant of part (a).
(c) The resultant of the pressure forces exerted by the water on the face BC of the dam.

(20 marks)

Q.3 Draw the shear and bending moment diagrams for the beam and loading shown in Figure Q.3. Using the diagram determine:

(i) Point of inflexion
(ii) Maximum shear force
(iii) Maximum bending moment

(20 marks)

Q.4 (a) Show that the moment of inertia; I_x of triangle is given by:

$I_x = bh^3/12$

Where b and h are the base and height of a triangle.

(6 marks)

(b) Determine the moment of inertia of the section shown in Figure Q.4(b) with respect to O – O axis.

(14 marks)

Q.5 (a) For the mechanism shown in Figure Q.5(a) P = 40N, L = 0.8m and Θ = 30°. Using the method of virtual work, determine the magnitude of the couple **M** required to maintain the equilibrium of the mechanism. **(8 marks)**

(b) The position of boom ABC is of Figure Q.5(b) controlled by the hydraulic cylinder BD. Using the principal of virtue work force exerted by the hydraulic cylinder on pin B when Θ = 70°. **(12 marks)**