



TECHNICAL UNIVERSITY OF MOMBASA
**Faculty of Engineering &
Technology**

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2214: STRENGTH OF MATERIALS II

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2013

TIME ALLOWED: 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 **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One (Compulsory)

a) Test on a steel struts with both ends fixed in position but free in direction gave the following results:

Test No	Slenderness Ratio	Average Test at Failure
1	70	200N/m ²
2	170	69N/m ²

- (i) Assuming these values are in agreement with Rankin's formula, find two constants in the formula i.e. f_c and a **(4 ½ marks)**
- (ii) If the steel bar of rectangular section 60mm by 20mm and of length 1.25m is used as a strut with both ends fixed in position and direction, find the safe load using constants in (i) above and employing a load factor of 4. **(4 marks)**
- b) Outline **THREE** assumptions of Euler's column theory **(1 ½ marks)**

c) Figure 1(c) is a trapezoidal cross section wall. From the basic principles, show that horizontal force P is given by:

$$P = \frac{wh^2}{2} \cot \theta \tan(\theta - \phi)$$

(10 marks)

Question Two

Draw the following roof trusses:

(20 marks)

- (i) W.W. Double fink
- (ii) Shed
- (iii) Mansard
- (iv) Queen
- (v) How we truss

Question Three

Draw the following steel structure connections:

- a) Column splices of equal sections
- b) Riveted plate and angle base for small column
- c) Beam to column joint with a simple welded and bolted detail
- d) Beam to beam joints of a secondary beam with welded end plates bolted to main beam

(20 marks)

Question Four

Figure 2 shows a cross-section through asphalt on granular base pavement and drainage system. Draw the section to scale and clearly label, dimension and indicate the scale.

(20 marks)

Question Five

Figure 3 shows an indirect and water system. Sketch the figure and clearly indicate the flow of water, clearly labeling the various sanitary appliance

(20 marks)