



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

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR DECREE IN:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING (BSCE)

ECE 2215: THEORY OF STRUCTURES II

END OF SEMESTER EXAMINATION

SERIES: APRIL 2015

TIME ALLOWED: 3 HOURS

Instructions to Candidates:

You should have the following for this examination

- Answer Booklet
- Pocket Calculator

This paper consists of **FIVE** questions. Answer questions **ONE (Compulsory)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

Use neat, large and well labeled diagrams where required

This paper consists of **THREE** printed pages

Question One (Compulsory)

- a) The following systems of wheel loads move from left to right on a 15m span.

Load (KN)	20	60	60	50	40
Distance (m)	1.5	1.5	2.0	1.0	

For a section C 4m from the left support, determine:

- (i) Maximum bending moment
- (ii) Maximum shear force

(10 marks)

- b) A three hinged parabolic arch of 40m has abutments at unequal levels. The highest point of the Arch is 4m above the left support and 9m above the right abutment. The arch is subjected to a udl of 15KN/m over its entire horizontal span. Find the horizontal thrust and bending moment at a point 8m from the left support, the radial shear and normal thrust at this point **(10 marks)**

$$r_2 = 9\text{m}$$

- c) A suspension cable of horizontal span 95m is supported at two different levels. The right support is higher than the left support by 4m. The dip to the lowest point of the cable below the left support is 5m. The cross-sectional area of the cable is 3500mm². Find the uniformly distributed load that can be carried by the cable if the maximum stress is limited to 60N/mm² **(10 marks)**

Question Two

- a) Define the term influence line and briefly explain its application to application in the analysis of structures **(3 marks)**
- b) A train of 5 wheel load crosses a simply supported beam of span 22.5m. Using the influence lines, calculate the maximum positive and negative shear forces at mid span and absolute maximum bending moment anywhere in the span. **(17 marks)**
- 120K 160KN 400KN 260KN 240KN

Question Three

- a) Using clear sketches, show the procedure of analyzing the influence line for through and deck bridge **(8 marks)**
- b) For the sloping chord through type truss shown in figure 3(b) draw the influence line for members IM and LE

3m

Question Four

A cable is hung between two points at a horizontal distance of 120m. The vertical distance between the tops of support 24m as shown in figure 4a – It carries three vertical loads of magnitude 60, 70 and 30KN at horizontal distances of 30, 60 and 90m from the left support respectively. Determine the cable profile and the length of cable. If the diameter of the cable is 50mm find the maximum stress which can be included in the cable **(20 marks)**

30m 30m 30m 30m

Question Five

- a) Using double integration method, show that for a cantilever with uniformly distributed load, the maximum deflection is given by:

$$y = \frac{WL^4}{8EI}$$

(15 marks)

- b) Discuss the rules to be observed while using Macaulay's method of slope and deflection

(5 marks)