



## TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF ENGINEERING AND TECHNOLOGY  
DEPARTMENT OF BUILDING & CIVIL ENGINEERING  
**UNIVERSITY EXAMINATION FOR:**  
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

### ECE 2515 : STRUCTURAL DESIGN IV

SPECIAL/SUPPLEMENTARY EXAMINATION

**SERIES: SEPTEMBER 2018**

**TIME: 2 HOURS**

#### **Instructions to Candidates**

You should have the following for this examination

*-Answer Booklet, examination pass and student ID*

This paper consists of five questions.

Attempt question ONE (Compulsory) and any other TWO questions.

**Do not write on the question paper.**

#### **QUESTION ONE (COMPULSORY) 30 Marks**

Design a bridge with 2 No. 19m spans center to center of bearings. The bridge is 7.3m wide and has a carriage way with 2 No. 2m wide footways. It has a 125mm thick surfacing and it will carry an urban all-purpose single carriageway road.

#### **ANSWER ANY TWO QUESTIONS FROM THIS SECTION**

##### **QUESTION TWO (20 Marks)**

- Clearly discuss three seismic structural systems that are normally used in earthquake prone zones (9 Marks)
- Briefly discuss five steps that are normally considered in the process of designing new bridges. (11 Marks)

##### **QUESTION THREE (20 Marks)**

The substitute frame of a multi-storeyed building having 3 bays has a continuous beam ABCD with  $AB = 4.0$  m  $BC = 2.5$ m and  $CD = 4.0$ m. The beams are spaced at 3 m intervals. The thickness for floor slab = 120 mm. Live load (office floor) =  $4$  kN/m<sup>2</sup>. Floor finish =  $0.6$  kN/m<sup>2</sup>. Size of beams = 250 mm by 400 mm. Size of columns = 250 mm by 400 mm. Height between



floors = 4m. Analyze the substitute frame and estimate the maximum design moments in the beams and columns.

**QUESTION FOUR (20 Marks)**

Briefly discuss five construction techniques that have to be included when designing structures to improve their earthquake resistance. (20 Marks)

**QUESTION FIVE (20 Marks)**

Determine the design moment for a reinforced concrete bridge deck slab that has 6m wide carriageway and the deck spans 34m center to center of bearings. The deck should be designed to carry 30 units of HB load. (20 Marks)