

**MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY  
(MMUST)**

**UNIVERSITY EXAMINATIONS  
2013/2014 ACADEMIC YEAR**

**FIFTH YEAR SECOND SEMESTER EXAMINATIONS**

**FOR THE DEGREE OF BACHELOR OF SCIENCE IN CIVIL AND  
STRUCTURAL ENGINEERING**

**COURSE CODE:** CSE 516E

**COURSE TITLE:** DESIGN OF BRIDGES

**DATE:**

**DURATION: 3HOURS**

**INSTRUCTIONS TO CANDIDATES:**

Answer ALL questions SECTION A and ONE question in SECTION B.  
Marks for each question are indicated in the parenthesis.  
Standard codes and manuals relevant to the subject are allowed.  
The usual notations apply.

## **SECTION A (ANSWER ALL QUESTIONS)**

### **Question 1 (25 marks)**

- a) With aid of well labeled sketches distinguish the following types of bridges (10 Marks)
- i. Suspension and cable stayed bridge
  - ii. Beam bridge and arch bridge
- b) Briefly describe the following types of bridge inspection ( 15 marks)
- i. Initial inspection
  - ii. Routine inspection
  - iii. Damage inspection
  - iv. In-depth inspection
  - v. Special inspection

### **Question 2 (25 marks)**

- a) Explain how the following factors may influence conceptual choice of bridge type (20 marks)
- i. Clearance requirements
  - ii. Loading
  - iii. Local skills and materials
  - iv. Topography and geology
  - v. Inspection and maintenance
- b) Outline three common deficiencies in steel bridges and their rehabilitation measures (5marks)

### **Question 3 (25marks)**

- a) Describe how the following preliminary information is essential in planning of a new bridge (15 marks).
- i. Topographic
  - ii. Hydrologic
  - iii. Geotechnical
- b) Determine the following critical moments for 12 m wide bridge deck slab with a span of 34m.
- i. The maximum design bending moment per metre width due to HA loading for the bridge deck. (5 marks).
  - ii. The maximum design bending moment per metre width for the bridge due to 30 units of type HB loading (5 marks).

## **SECTION B (ANSWER ONE QUESTION ONLY)**

### **Question 4 (25 marks)**

Design a simply supported reinforced concrete bridge deck slab using a unit strip method. The depth of the deck is 500mm and carries a 100mm depth of surfacing, together with a nominal HA live load udl of  $18 \text{ kN/m}^2$  and knife edge load of  $30 \text{ kN/m}$ . The span of the deck is 12.0m centre to centre of bearings.

### **Question 5 (25 marks)**

Design a simply supported steel beam for a bridge which carries a 150mm thick concrete slab together with a nominal live load of  $10.0 \text{ kN/m}^2$ . The span of the beam is 9.0m centre to centre of bearings and the beams are spaced at 3.0 m intervals. The slab will be assumed to be laid on top of the beams with no positive connection to the compression flange.