

**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 kN/m^2 and knife edge load of 30 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 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.