



MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
FIFTH YEAR SECOND SEMESTER EXAMINATION FOR
BACHELOR OF SCIENCE (CIVIL ENGINEERING)
ECV 517: DESIGN OF BRIDGES

DATE: 7/12/2021

TIME: 8.30-10.30 AM

INSTRUCTIONS

- This paper comprises of FIVE questions. Answer **THREE** questions
- Question one is **compulsory** and carry 30 marks
- Answer any other **TWO** questions

QUESTION ONE (30 MARKS)

- With clear sketches, briefly discuss five major types of concrete bridges. (10 marks)
- Design a reinforced concrete bridge deck whose total width is 8m inclusive of footway and cycle way on either side of the runway. The deck span is 50m. The deck should be designed to carry 30 units of HB load in load combination 1. (20 marks)

QUESTION TWO (20 MARKS)

- Discuss five duties of the bridge inspection team under the different stages involved in bridge inspection. (10 marks)
- Discuss how preventive maintenance can be achieved in the following reinforced concrete bridge parts:
 - Deck (5 marks)
 - Expansion joints (5 marks)

QUESTION THREE (20 MARKS)

- a) Briefly discuss the HA and HB loading as applied to bridge engineering design. (10 marks)
- b) Briefly discuss the different steps involved when planning for construction of a new bridge (10 marks)

QUESTION FOUR (20 MARKS)

A bridge super-structure is of reinforced concrete deck type supported on medium span pre-stressed girders. The bridge has three spans, the middle span being 280m, and two end spans at 145m each. The bridge deck total width is 15m in total inclusive of the footway and cycle way on either side. Design the bridge assuming that it is also to carry 30 units of HB loading.

QUESTION FIVE (20 MARKS)

- a) Clearly discuss the five major basic types of inspections that can be performed on a bridge structure. (10 marks)
- b) A reinforced concrete (single span) T beam bridge is to consist of 5 beams 1.75 m apart. The span of the bridge is 12 m clear with end bearings of 600mm. The live load on the bridge is 17000N/m^2 including impact. The carriageway over the bridge is to 7m wide with a footpath of 1.5m width on either side. The loading on the footpath may be taken as 3900N/m^2 . Design the bridge. (10 marks)